PESTICIDES ABSTRACTS

November 1977 - Vol. 10, No. 11
Abstracts 77-2255-2580
PSTAB 10(11): 593-659 (1977)

U.S. ENVIRONMENTAL PROTECTION AGENCY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Volume 10 **November 1977** **No. 11**

Page

General 593
(News items, letters, and editorials appearing in scientific and technical journals; information on production and use; and other items of general interest)

Monitoring and Residues 595
(levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 604
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 613
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 648
(preparation of samples; analytical methods; instrumentation)

77-2255 Wells, L. F., Jr ; Girard, K. F. (Dep. Environ. Qual. Eng., 600 Washington St., Boston, MA 02111) **Bats, rabies and DDT.** *N. Engl. J. Med.* 297(7): 390-392; 1977. (12 references)

DDT has proven highly effective against big brown bats, which have been found to carry rabies in Massachusetts. However, its application for bat control was not strictly supervised until 1972. In 1973 and 1974 the Massachusetts Department of Public Health continued to grant permits to use DDT for bat control under a stringent system of requirements. EPA refused permission to continue this use in 1975, stating that the Department of Public Health had not demonstrated a serious public health risk if DDT use were banned. Case by case use permits were granted for the use of DDT sprays in the summer of 1976, and one crisis exemption permitted the use of DDT dust. Regulations adopted by the Massachusetts Pesticide Board on March 23, 1977, are more stringent than those promulgated by the Center for Disease Control; they specify that persons using DDT for bat control must be trained in such use, must have pre-exposure immunization against rabies, and must be supervised in DDT application by appropriate state or local health officials. A compromise must be reached between unrestricted use of pesticides and unavailability of needed protection.

77-2256 Duttweiler, D. W. ; Malakhov, S. G. (Environ. Res. Lab., Environ. Protect. Ag., Athens, GA 30601) **USA—USSR symposium on environmental transport and transformation of pesticides** *J. Agric. Food Chem.* 25(5): 975-978; 1977.

Under the 1972 USA-USSR Agreement on Cooperation in the Field of Environmental Protection, a joint project committee on environmental transport of agricultural chemicals (pesticides and fertilizers) began a cooperative program of information exchange in December 1974. Scientists of both countries visited research centers for familiarization with agricultural use of pesticides and nutrients and with current concepts and research on environmental effects of these chemicals. To focus on a scientific question of particular mutual concern, the joint project committee sponsored a 7-day symposium on the Environmental Transport and Transformation of Pesticides, which was hosted by the Soviet side at Tbilisi, Oct 20-27, 1976. The Symposium was held in conjunction with the fourth meeting of the USA-USSR Joint Project Committee for Project 02.03-31. "Forms and Mechanisms by Which Pesticides and Chemicals Are Transported". Eleven U.S. delegates met with 26 Soviet scientists to discuss six main topics. Opening remarks by G.G. Svanidze (USSR), D. W. Duttweiler (USA), and S. G. Malakhov (USSR) emphasized mutual interest in the subject, the importance of pesticides to agricultural productivity, and the value of scientific understanding of the environmental entry, transport, transformation, ecological effects, and ultimate residual distribution of pesticides. (Author abstract by permission of the American Chemical Society)

77-2257 Gangstad, E.; Novosad, C.; Nailon, W. T.; Guerra, L. V.; Maddox, D. M. (Dep. Biol., Athens Coll., Athens, AL) **Aquatic plant control program. Technical report 9. Integrated control of alligator weed and water hyacinth in Texas.** *Natl. Tech. Inform. Serv.* AD-A008,980, 104 p.; 1975.

The technology and impact of the Aquatic Plant Control Program are summarized in the report. Detailed studies on the integrated control (biological control plus chemical control) of alligator weed and water hyacinth concern the environmental aspects, fundamentals of drift control, by droplet size selection, herbicides as antipollutants, phenoxy herbicide residues and their persistance, and plant control problems encountered at a reservoir in Texas. (Author abstract by permission)

77-2258 Army Scientific Advisory Panel (Washington, DC) **Report of the army scientific advisory panel ad hoc group on environmental quality control.** *Natl. Tech. Inform. Serv.* AD-A009, 191, 22 p.; 1975.

In response to an increasing national environmental awareness and to legislative and regulatory mandates, the Army initiated an Environmental Quality Control (EQC) Research and Development program, with separate identifiable efforts. Because of deadlines imposed by these legislative and regulatory mandates to curtail or reduce pollution levels in specific areas and specific facilities, the initial thrust of the program was devoted to finding quick solutions to the immediate problems. In view of the above, an ASAP Ad Hoc Group was established to review the Army's EQC Research and Development Program. The report discusses areas of concern and presents recommendations. (Author abstract by permission)

77-2259 DeBord, D. V. ; Carison, G. A.; Axtell, R. C. (North Carolina Agric. Exper. Stn., Raleigh, NC) **Demand for and cost of coastal salt marsh mosquito abatement.** *Natl. Tech. Inform. Serv.* COM-75-10716, 9 p.; 1975.

Data related to mosquito abatement activities for 30 East Coast districts for 1959 through 1971 were analyzed. A trend analysis was conducted on mosquito densities, temporary and permanent abatement work, total abatement expenditures and per capita abatement expenditures. A four-equation pest management model was used to examine the responsiveness of mosquito numbers to permanent and temporary abatement procedures and to analyze the factors affecting the demand for mosquito abatement. A regression model was used to check for possible economies of scale in permanent and temporary abatement work. The analysis revealed that both temporary and permanent abatement procedures significantly reduced the average mosquito population during the 13-year period. The demand for abatement was determined to be affected by income, state grants, tourism, the wage rate (a proxy for price), and population. The implications of these results are discussed in relation to the formation of new abatement districts. (Author abstract by permission)

77-2260 Patterson, J. W. (Dep. Environ. Eng., Illinois Inst. Technol., Chicago, IL) **State-of-the-art for the inorganic chemicals industry: inorganic pesticides.** *Natl. Tech. Inform. Ser.* PB-240,959, 67 p.; 1975.

A literature and field study of the manufacture of inorganic pesticides revealed that many inorganic formulations are still widely used for agricultural purposes. The inorganic pesticide industry's manufacturing processes and wastewaters contrast sharply with those associated with organic pesticides. The inorganic pesticide market is dominated by eight products (zinc sulfate, sulfur, sodium borate, sodium chlorate, sodium arsenite, lead arsenate, copper sulfate, and calcium arsenate), each of which is discussed in this report with respect to its manufacturing effluent characteristics and applicable pollution control technology. Based upon field studies, it has been demonstrated that five of the eight products can be manufactured without generating any process wastewater. Aqueous effluents from the manufacture of the remaining three inorganic pesticides appear to be directly controllable by previously demonstrated in-plant control and/or wastewater treatment technologies. (Author abstract by permission)

77-2261 Midwest Res. Inst. (Kansas City, MO) **Substitute chemical program—initial scientific and minieconomic review of bromacil.** *Natl. Tech. Inform. Serv.* PB-241,801, 88 p.; 1975.

This report is one of a series of in-depth scientific literature searches which review the safety and efficacy of substitute chemicals registered by EPA as possible replacements for cancelled or suspended pesticides or pesticides in litigation. This report on bromacil, a registered substitute chemical for certain cancelled and suspended uses of 2,4,5-T, covers all uses of bromacil and is intended to be adaptable to future needs. It also, where applicable, identifies areas where technical data may be lacking so that appropriate studies may be initiated to develop desirable information. The review is a compilation and summarization of published and unpublished scientific test and use data from various sources. It discusses manufacture, toxicity, uses and cost effectiveness. (Author abstact by permission)

77-2262 Midwest Res. Inst. (Kansas City, MO) **Substitute chemical program—initial scientific and minieconomic review of malathion.** *Natl. Tech. Inform. Serv.* PB-241,818, 262 p.; 1975.

The review is an in-depth scientific literature search on the safety and efficacy of substitute chemicals registered by EPA as a possible replacement for cancelled or suspended pesticides or pesticides in litigation. This report on malathion, a pesticide substituting for some uses of DDT, reviews the chemistry and analytical methods, its toxicity to laboratory and domestic animals and to humans, its effects on the environment, and its use patterns, costs and efficacy. The review is a compilation and summarization rather than an interpretation of published and unpublished scientific test and use data from various sources. (Author abstract by permission)

77-2263 Midwest Res. Inst. (Kansas City, MO) **Substitute chemical program--initial scientific and minieconomic review of parathion.** *Natl. Tech. Inform. Serv.* PB-241,819, 283 p.; 1975.

This report is part of a program to review the safety and efficacy of substitute chemicals registered by EPA as possible replacements for cancelled or suspended pesticides or pesticides in litigation. This report on parathion, a pesticide substituting for DDT, reviews the substitute chemical's chemistry and analytical methods, its toxicity to laboratory and domestic animals and to humans, its effects on the environment, and its use patterns, costs and economic efficacy. The review is a compilation and summarization rather than an interpretation of published and unpublished scientific test and use data from various sources. (Author abstract by permission)

77-2264 Midwest Res. Inst. (Kansas City, MO) **Substitute chemical program--initial scientific and minieconomic review of methyl parathion.** *Natl. Tech. Inform. Serv.* PB-241,840, 187 p.; 1975.

This report contains a scientific and minieconomic review of methyl parathion ((*O,O*)-dimethyl *O-p*-nitrophenyl phosphorothioate). Methyl parathion was identified as a registered substitute chemical for certain cancelled and suspended uses of DDT. The substitute chemical is reviewed for suitability considering all applicable scientific factors such as: chemistry, toxicology, pharmacology and environmntal fate and movement; and socio-economic factors such as: use patterns and costs and benefits. The review covers all uses of methyl parathion and is intended to be adaptable to future needs. (Author abstract by permission)

77-2265 Duncan, L. ; Elcock, D.; Hollins, G. (Mitre Corp., McLean, VA). **Environmental statistical report.** *Natl. Tech. Inform. Serv.* PB-246,233, 255p.; 1975.

The report contains a variety of environmental and related data presented in approximately 200 statistical and summary tables. The tables are arranged by data type, under 16 subject sections. These sections are: Air quality, water quality, land use, solid waste and recycling, pesticides and toxic substances, agriculture and food supply, forests and wildlife, water resources, recreation, mineral, energy, environmental impact statements. (Author abstract by permission)

77-2266 Batora, V. ; Kovacicova, J.; Institorisova, A. (Natl. Inst. Agrochem. Technol., Bratislava, Czechoslovakia.) **Rezidua dinoseb-acetatu a dinosebu. [Residues of dinoseb acetate and dinoseb.]** *Agrochemia (Bratislava)* 17(7): 199-202; 1977. (25 references) (Czech)

Dinoseb and dinoseb acetate residues can be selectively determined following field treatment with dinoseb acetate. Possible determination methods include gas chromatography after derivatization of DNBP with diazomethane, spectrophotometric determination at 380 nm after chromatographic isolation of DNBP acetate on a florisil column. A detailed procedure is given for the last method. The dection limits are 0.2-0.4 mg/kg for DNBP acetate and 0.06 to 0.1 mg/kg for DNBP. The average recoveries for DNBP were 76.4% from alfalfa and 104.9% from homogenized green peas and horse beans and for DNBP acetate, 61.2% from alfalfa and 87.7% from green peas and horse beans. Results of analyses of field-grown and greenhouse grown vegetables revealed rapid decreases in the levels of DNBP and DNBP acetate residues 7 and 11 days after DNBP acetate application. It was anticipated that treatment with DNBP acetate at 5 dm^3/ha would not result in excessive DNBP residues.

77-2267 Sugaya, T. ; Hayashi, S.; Meguro, Y.; Minakawa, N.; Sasaki, S.; Suzuki, Y.; Watanabe, K. (Inst. Rural Med. Hiraga General Hospital, Hiraga, Akita, Japan) **Organochlorine pesticide residues in human milk, adipose tissues and visceral organs** *Akita-ken Noson Igaku Kenkusyho Nenpo (Annu. Rep. Res. Inst. Rural Med., Akita)* 4:17-22; 1974. (Japanese)

Organochlorine pesticide residues such as β-BHC, DDE and *p,p*ç-DDT were determined in human milk samples, adipose tissues and visceral organs. The samples were collected in Hiraga General Hospital over a one year period beginning in April, 1974. The average, maximum and minimum contents of β-BHC, DDE, and *p,p*ç-DDT in 22 samples of milk were 2.313, 6.277 and 0.917; 1.728, 3.591 and 0.773; and 0.551, 1.723, and 0.511 ppm (fat basis). Beta-BHC and DDT were detected in all samples; *p,p*ç-DDT was detected in 68.2%. Compared to the values of former years a declining trend was reconized. Those values in human adipose tissues were 2.991, 6.424 and 0.764; 1.776, 4.128 and 0.723; and 1.519, 7.032 and 0.068 ppm per g of tissue, showing no great difference from those of former years. Residues in human visceral organs such as the kidney, liver, spleen, adipose tissue, and greater omentum ranged from 0.946 to 0.371, 0.873 to 0.245, and 2.642 to 0.113 ppm per g of sample. Beta-BHC and DDE were detected in all samples. In adipose tissue, no yearly variation or trend could be found. Beta-BHC remained at highest levels in the kidney (0.591) followed by liver (0.218), brain (0.112), and spleen (0.104 ppm). DDE remained at highest levels in kidney (0.536) followed by liver (0.197), spleen (0.136), and brain (0.079 ppm).

77-2268 Public Health Dep. (Osaka Prefect. Off., Osaka, Japan) **[Countermeasures for food contamination due to trace amounts of harmful materials. Part 1. Countermeasures for agricultural pesticide residues.]** *Osaka Fuitsu Koshu Eisei Kenkyusho Nenpo (Annu. Rep. Osaka Public Health Inst.)* 50: 153-154; 1977. (Japanese)

Results of a survey on pesticide residues in foods are reported, the foods having officially established residue standards. The total number of food samples examined in 1973, 1974 and 1975 was 329, 273 and 298, respectively consisting of 80, 81 and 91 vegetables, 63, 60 and 57 fruits, 23, 16 and 14 potatoes, 7, 2 and 5 cereals, 11, 0 and 6 tea leaves, and 54, 56 and 57 milks, in year order. The results show a yearly reduction of pesticide residues; however, in 1975, 2 samples contained residues in excess of the standard, probably due to soil contamination. During these 3 years about 36, 17 and 24 samples of dairy products, fish and shellfish and meats respectively were examined for pesticide residues (no standard was established for these). None of these residue levels exceeded the standard for cow's milk.

77-2269 Suzuki, Y. ; Sasaki, S.; Watabe, K.; Meguro, Y.; Hayashi, S.; Sugaya, H. (Lab. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan) **[Organochlorine pesticide residues in humans: results of investigations in 1977.]** *Akita-Ken Noson Igakkai Zasshi (Akita J. Rural Med.)* 23(2): 15-19; 1977. (4 references) (Japanese)

A dieldrin-like peak in a gas-chromatogram of mother's milk and human adipose tissue was identified as dieldrin itself by mass-spectrometry; other peaks were identified as beta-BHC, DDE, and *p,p'*-DDT. Residues of organochlorine pesticides such as α-, β-, and γ-BHC (lindane), DDE, *o,p'*-DDT, *p,p'*-DDT, and dieldrin in mother's milk (22 samples) and human adipose tissues (24 samples) collected in a hospital during one year beginning in April 1975 were determined and compared with the data of past years. Residues in mothers' milk (fat basis) averaged 0.093 ppm α-BHC, 2.442 ppm β-BHC, 0.020 ppm lindane, 2.352, ppm DDD 0.073 ppm *o,p*ç -DDT, 0.425 ppm *p,p*ç-DDT, and 0.230 ppm dieldrin. When compared to those in former years, no marked reduction was found. In adipose tissue, the average values of the residues were 0.132 ppm α-BHC, 2.476 ppm β-BHC, 0.016 ppm lindane, 2.320 ppm DDE, 0.076 ppm *o,p'*-DDT, 1.069 ppm *p,p'*-DDT and 0.254 ppm dieldrin per gram of fat. Except for β-BHC and DDE, the values showed a slight yearly increase. Marked differences in such residues were not found between tumor patients and other patients. Residues of β -BHC averaged 2.904, 2.085, 0.718, 0.482 and 0.104 ppm per gram in greater omentum, subcutaneous fat, kidney, liver, and spleen.

77-2270 Iwata, Y. ; Ittig, M.; Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Degradation of *O,O*-dimethyl *S*-(α-(carboethoxy) benzyl) phosphorodithioate (phenthoate) in soil.** *Arch. Environ. Contam. Toxicol.* 6(1): 1-22; 1977. (16 references)

The degradation of ring-labeled ^{14}C-phenthoate in a moist sandy loam and silty clay loam soil was studied. Phenthoate degradation was attributed to the action of extracellular heat-labile soil enzymes which converted it to its carbon

ester hydrolysis product, phenthoate acid. Thus, rate of phenthoate degradation was greatly retarded in autoclaved soil, but was equally rapid in nonsterile soil under both aerobic and anaerobic conditions. Degradation was also rapid even at a soil treatment of 100 ppm. Phenthoate acid was extensively degraded to $^{14}CO_2$ by soil organisms under aerobic conditions, but due to unfavorable factors, degraded only by slow first-order kinetics under anaerobic conditions and at the 100 ppm fortification level under aerobic conditions. Phenothoate and phenthoate acid were confirmed as the principal soil components by isolation and identification by IR and NMR data.

77-2271 Woodrow, J. E. ; Seiber, J. N.; Crosby, D. G.; Moilanen, K. W.; Soderquist, C. J.; Mourer, C. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Airborne and surface residues of parathion and its conversion products in a treated plum orchard environment** *Arch. Environ. Contam. Toxicol.* 6(2-3): 175-191; 1977. (36 references)

Airborne pesticide residues were collected both within and downwind from a parathion-treated plum orchard by high volume sampling through XAD-4 macroreticular resin. Levels of paraoxon in excess of 100 ng/m^3 were found in orchard air, along with parathion, during the early days of two 21-day sampling studies. Paraoxon:parathion ratios in the orchard air were relatively constant, averaging ca. 0.5 for days 1 to 21 following treatment. Likely sources of airborne paraoxon include vaporization and dislodgement from soil and leaf surfaces, and chemical conversion of parathion in the air. Support for the latter came from observation of an increased paraoxon:parathion ratio in air samples collected downwind from the orchard. Atmospheric conversion of parathion to paraoxon, accelerated by sunlight, was indicated by both field and laboratory studies. Overall dissipation of parathion from the orchard air, soil, and leaf tissue proceeded to a considerable extent through breakdown to paraoxon under the dry climate conditions of these studies. Eventual conversion to the relatively stable breakdown product, *p*-nitrophenol, was indicated from analysis of air in the orchard vicinity. (Author abstract by permission)

77-2272 Nigg, H. N. ; Allen, J. C.; Brooks, R. F.; Edwards, G. J.; Thompson, N. P.; King, R. W.; Blagg, A. H. (Agric. Res. Educ. Ctr., IFAS Univ. Florida, Box 1088, Lake Alfred, FL 33850) **Dislodgeable residues in ethion in Florida** citrus and relationships to weather variables. *Arch. Environ. Contam. Toxicol.* 6(2-3): 257-267; 1977. (23 references)

Five different treatments of ethion on Valencia orange trees were compared for decay rates and for ethion monoxon and ethion dioxon production under different environmental conditions. The oxon metabolite levels observed were low and always below the residue level of ethion itself. There were no significant differences in the decay rates of ethion between treatments. A model of ethion decay utilizing environmental variables as a time base is presented. This model expalins 94% of the variation observed in ethion decay during very wet and very dry periods in Florida. The application of these results and general experimental approach to worker safety reentry standards is discussed. (Author abstract by permission)

77-2273 Zepp, R. G. ; Wolfe, N. L.; Azarage, L. V.; Cox, R. H.; Pape, C. W. (Environ. Res. Lab., U.S. Environ. Protect. Ag., Athens, GA 30601) **Photochemical transformation of the DDT and methoxychlor degradation products, DDE and DMDE, by sunlight** *Arch. Environ. Contam. Toxicol.* 6(2-3): 305-314; 1977. (23 references)

DDE and DMDE, degradation products of the pesticides DDT and methoxychlor, rapidly undergo an unusual photoisomerization in solution when exposed to sunlight. The isomerization involves the exchange of a vinyl chlorine and an *ortho* aromatic hydrogen. Other photoproducts identified were corresponding benzophenones and 1,1-diaryl-2-chloroethylenes. Quantum yields for the reactions were measured and then used to compute sunlight photolysis half-lives for DMDE and DDE. Although both compounds absorb only the short-wavelength ultraviolet component of sunlight, their photolysis was found to be surprisingly rapid. During summer at latitude 40°N, the photolysis half-lives near the surface of a water body are one hour and one day for dissolved DMDE and DDE, respectively. Photolysis of the DDE photoisomers is about an order of magnitude slower than that of DDE, suggesting that they may accumulate under environmental conditions. The DDE photoisomers photocyclize to form chlorinated dibenzofulvene and dichlorofluorenone. Neither DDE nor its photoisomers photoreact in solution to form PCB's. The environmental significance of these results is discussed, and it is suggested that the persistence of DDE in inland surface waters may be related to its tendency to sorb onto sediments and biota where no light is present. (Author abstract by permission)

77-2274 Greichus, Y. A. ; Greichus, A.; Amman, B. D.; Call, D. J.; Hamman, D. C. D.; Pott, R. M. (Dep. Chem., South Dakota State Univ., Brookings, SD 57006) **Insecticides, polychlorinated biphenyls and metals in African lake ecosystems. I. Hartbeespoort Dam, Transvaal and Voelvlei Dam, Cape Province, Republic of South Africa** *Arch. Environ. Contam. Toxicol. 6(2-3)* 6(2-3): 371-383; 1977. (32 references)

Concentrations and distribution of chlorinated hydrocarbon insecticides, polychlorinated biphenyls (PCB's) and some metals were determined in two South African lakes, Hartbeespoort Dam and Voelvlei Dam. Water, bottom sediments, aquatic plants, aquatic insects, fish, fish-eating birds and their eggs were collected. Insecticides and PCB's were analyzed by thin layer and gas chromatography and mass spectrometry. Analysis of metals was accomplished with atomic absorption spectrophotometry. Metals included arsenic, cadmium, copper, manganese, lead, zinc, and mercury. The insecticide residues most commonly found in both dams were DDE, DDD, DDT, and dieldrin. Hartbeespoort had higher levels than Voelvlei of insecticides and PCB's in all types of samples common to both lakes. Concentrations of

PCB's having six or more chlorines increased with an increase in the trophic level. Concentrations of PCB's in the brains of the African birds were greater than the average total concentration of insecticides while the opposite was true for carcasses. Biological magnification of insecticides and PCB's occurred in both lakes. Hartbeespoort Dam had higher levels than Voelvlei for all metals examined in bottom sediments and birds, except for copper in bird carcasses. Mercury levels in bird carcasses ranged from 2- to 5-fold greater than in fish while lead concentrations ranged from 2- to 10-fold greater. (Author abstract)

77-2275 Davis, J. E. ; Staiff, D. C.; Butler, L. C.; Armstrong, J. F. (U.S. Environ. Prot. Agency, Health Eff. Res. Lab., Field Stud. Section, Wenatchee, WA 98801) **Persistence of methyl and ethyl parathion following spillage on concrete surfaces** *Bull. Environ. Contam. Toxicol.* 18(1): 18-25; 1977. (4 references)

Since it is almost impossible to remove and replace concrete flooring contaminated by pesticide spills, the persistence of methyl parathion and parathion on concrete was examined. Smooth concrete blocks placed indoors and outdoors were covered with a methyl parathion emulsifiable concentrate which was allowed to soak in before swab samples were taken. Samples were taken periodically for one year. After the swab tests 60 g muslin flour sacks were placed on the blocks and weighted down for 24 hr with a 2.1 kg brick. In a second test series the blocks rough and smooth surfaced, were placed outdoors, contaminated with parathion or methyl parathion, and subjected to minimal cleanup comprising absorption of excess liquid, flushing with water, and scrubbing with a brush. The hazard due to methyl parathion decreased rapidly but was prolonged by protection of the concrete surface from direct light and moisture. Absorption of methyl parathion by bagged flour was considerable. Paper flour sack material afforded considerably more protection against contamination than muslin sacking. Parathion remained potentially hazardous for far longer than methyl parathion. An increase in available residues after winter weathering was attributed to enhancement of pesticide migration from the block interior to the surface. The hazard was considered to be negligible after 3 mo for methyl parathion and 15 mo for parathion from outdoor spills and twice as long indoors. Physical sealing of contaminated surfaces is being investigated.

77-2276 Von Stryk, F. G. ; Bolton, E. F. (Res. Stn., Res. Br., Agric. Canada, Harrow, Ontario, Canada) **Atrazine residues in tile-drain-water from corn plots as affected by cropping practices and fertility levels** *Can. J. Soil Sci.* 57(3): 249-253; 1977. (10 references)

The herbicide atrazine was applied pre-emergence to corn plots which were drained by separate drains (average depth 70 cm). Water samples were collected from the tile outlets, extracted with chloroform, and the atrazine content determined by gas chromatography. The discharge of atrazine residues monitored over a 4-yr period ranged from 2.75 to 8.69 g/ha annually. The concentration varied between 0.5 and 3.50 μg/liter of water. Losses of atrazine were greater from plots under a continuous corn crop and a high fertility level than from plots under rotation corn and low fertility. (Author abstract by permission)

77-2277 Dudas, M. J. ; Pawluk, S. (Dep. Soil Sci., Univ. Alberta, Edmonton, Alberta T6G 2E3, Canada) **Heavy metals in cultivated soils and in cereal crops in Alberta** *Can. J. Soil Sci.* 57(3): 329-339; 1977. (35 references)

The content of cadmium, cobalt, copper, mercury, manganese, nickel, strontium, lead and zinc in several agricultural soils in Alberta was investigated. The abundances of these heavy metals were found to be low and represent levels naturally present in uncontaminated soils. Both pedogenesis and nature of parent material influenced the levels of heavy metals in surface soil horizons. On a local scale, drainage and groundwater effects contributed significantly to heavy metal redistribution in soil. Levels of heavy metals were also determined in seeds and straw of cereal grain crops grown on the soils of this study. Vegetative samples generally contained low amounts of heavy metals and for some of the physiologically essential elements (Cu, Mn, Zn), amounts in the plant material were at or near deficiency levels. Amounts of cadmium, mercury and lead were generally significantly higher in straw than in respective seed samples. (Author abstract by permission)

77-2278 Cheng, H. H. ; Braun, H. E. (Res. Stn., Agric. Canada, Delhi, Ontario N4B 2W9, Canada) **Chlorpyrifos, carbaryl, endosulfan, leptophos, and trichlorfon residues on cured tobacco leaves from field-treated tobacco in Ontario** *Can. J. Plant Sci.* 57(3): 689-695; 1977. (10 references)

Studies were carried out in 1971 and 1972 with chlorpyrifos [*O,O*-diethyl *O*-(3,5,6-trichloro -2- pyridyl) phosphorothioate] and leptophos [*O*-(4-bromo-2,5-dichlorophenyl *O*-methyl- phenylphosphorothioate] used for cutworm control, and in 1973 with carbaryl (1-naphthyl methylcarbamate), endosulfan (1,4,5,6,7,7-hexachloro -5- norbornene-2,3-dimethanol cyclic sulfite), and trichlorfon [dimethyl (2,2,2-trichloro -1- hydroxyethyl) phosphonate] used for hornworm control, to determine their residues in cured tobacco leaves. Chlorpyrifos, leptophos and trichlorfon were not detected in any of the cured leaf samples regardless of the formulations, method, and number of applications employed. Residues of carbaryl and endosulfan were detected in all samples and ranged from 0.4 to 4.0 ppm, and from 11.5 to 30.9 ppm, respectively, depending on the number of applications and the interval between the last treatment and harvest. The high residues of endosulfan obtained in the 1973 experiment were confirmed in a 1975 experiment. (Author abstract by permission)

77-2279 Mukhtar, M. (Univ. Hawaii, Honolulu, HI) **Desorption of adsorbed ametryn and diuron from soils and soil components in relation to rates, mechanisms, and energy of adsorption reactions** *Diss. Abstr. Int. B.* 38(1): 23-B; 1977.

A study was performed to examine the causes of hysteresis (irreversibility) in the adsorption-desorption process for two herbicides and its impact under field conditions. Adsorption on four soils of differing mineralogy and organic matter content and two clay minerals was investigated by the batch method. In a high organic matter soil adsorption and desorption proceeded rapidly during the first few hours and slowed down as the equilibrium time was approached. The faster adsorption equilibrium of ametryn was achieved, the larger was the hysteresis. This relationship was absent in the case of diuron. The magnitude of hysteresis increased with the magnitude of adsorption as expressed by the Freundlich adsorption constant for the various systems. The Freundlich constant, 1/n, did not exhibit any correlation with hysteresis. However, it was observed that the constant increased with temperature and its values were relatively high in montmorillonite clay and a montmorillonite based soil. Adsorption mechanisms appeared to be related to hysteresis. The hysteresis was larger when ionic attraction was the adsorption mechanism than where mainly physical forces were operative. In general, the higher the hysteresis, the larger was the absolute value of the standard free energy change. The bulk of diuron was carried by runoff water rather than by suspended soil in the field watershed portion of the study. (Author abstract by permission, abridged copies of the thesis are available from University Microfilms, Order No. 77-14,601)

77-2280 Zotov, V. M. ; Svirin, Yu. N.; Prusakova, R. M. (Inst. Occup. Hyg. Agric., Orel, USSR) **O razrabotke gigienicheskikh reglamentov pri vypolnenii rabot v teplitsakh, obrabotannykh yadokhimikatimi. [Hygienic regulations for workers working in greenhouses following pesticide application.]** *Gig. Tr. Prof. Zabol.* 3: 49-50; 1977. (2 references) (Russian)

The concentrations of DDVP (dichlorvos), zineb, and benlate (benomyl) were determined by a thin-layer chromatographic method in the air of greenhouses at different intervals after their application to establish the necessary waiting period between application and the resumption of work. Zineb and DDVP were applied in spray form at the respective rates of 6-20 kg/ha and 6-12 kg/ha, while benlate was poured on the soil at the rate of 6-10 kg/ha. Immediately after application, the concentrations in the air were 1.2 mg/m^3 for DDVP, 0.87 mg/m^3 for zineb, and 0.15 mg/m^3 for benlate. Benlate was not detectable 20 hr after application, DDVP 30 hr after application, and zineb 40 hr after application. Shaking the plants caused a 10-26% increase in the DDVP and zineb concentrations in the air. The findings indicate (in view of the MAC values) that the waiting period should be at least 20-24 hr after the application of DDVP, 15-20 hr after the application of zineb, and 20 hr after the application of benlate.

77-2281 Hiroshima Prefect. Agric. Exp. Stn. (Higashi-Hiroshima, Hiroshima, Japan) **[Survey for confirmation on the safety of pesticide residues.]** *Hiroshima-Kenritsu Nogyo Shikenjo Gyomu Nenpo (Annu. Rep. Hiroshima Prefect. Agric. Exper. Stn.)* 24; 1975. (Japanese)

In order to see the present state and to confirm the safety of pesticide residues after applying pesticides following the standard safe application methods, samples of pears treated with diazinon and those of grapes treated with fenitrothion were collected from respectively 4 and 6 fields, then the pesticides residue was determined. The results showed that no pesticide residue was more than 0.1 ppm (standard for diazinon) on pears or 0.2 ppm (standard for fenitrothion).

77-2282 Shitara, Y. ; Hori, Y.; Saito, T. (Hokkaido Inst. Public Health, Sapporo, Hokkaido, Japan) **[Studies on pesticide residues in foods Part 10. Results of determination of pesticide residues in agricultural products of Hokkaido in 1976.]** *Hokkaidoritsu Eisei Kenkyusho Ho (Annu. Rep. Inst. Publ. Health, Hokkaido)* 27: 72-76; 1977. (9 references) (Japanese)

Organochlorine pesticide residues such as BHC, DDT, dieldrin, aldrin, endrin, heptachlor and heptachlor epoxide were determined in 108 samples of vegetables, 6 samples of fruits, and 12 samples of pulse produced in Hokkaido in 1976. The content of BHC was lower (less than one tenth) than the standard value in each species except in carrot (average of 0.028 ppm); the content of DDT was far less than the standard value. The content of dieldrin showed a yearly reduction; however, in cucumber it was relatively high, and five samples showed residues above the standard. Only one samples of cucumber showed higher residue value than the standard.

77-2283 Kitayama, M. ; Kaneshima, H. (Hokkaido Institute of Public Health, Sapporo, Hokkaido, Japan) **[Studies on the prevention of intoxication due to pesticides. Part 24. Organochlorine pesticide residues in the water of rivers, lakes and seaports in Hokkaido.]** *Hokkaidoritsu Eisei Kenkyusho Ho (Annu. Rep. Inst. Publ. Health, Hokkaido)* 27: 97-98; 1977. (3 references) (Japanese)

Thirty water samples collected from 4 rivers (including 3 river mouths), 6 lakes, and 15 seaports were analyzed for isomers of BHC, total BHC and polychlorocyclodienes. DDT and its derivatives and polychlorocyclodienes were not detected in all samples; however, some isomers of BHC were detected in 30 samples (including water from 2 rivers) in the range of 0.00 - 0.07 ppb. When these results were compared to the values obtained in 1976 (0.02 - 1.55 ppb as total BHC and 0.000 - 0.161 ppm as total DDT) remarkable reduction of pesticides residue in these water samples could be seen. However, the rivers from which water samples were collected in 1976 were not the same as those in 1977.

77-2284 Dragomirescu, A. **[Necessity for performing toxicity tests in the laboratories of drinking-water plants.]** *Igiena* 26(1): 35-42; 1977. (Rumanian)

Tests suitable for water analysis in drinking water preparation facilities are reviewed and evaluated. Bioassay methods are advantageous for water testing because they assess the same factors that could be harmful to humans con-

suming the water. The major pesticides to be considered as water contaminants in Romania are the organochlorine compounds lindane, toxaphene, tetradifon, and 2,4-D; the organophosphates malathion and dimethoate; and a dinitrophenol compound, DNBP. LD50 values for these substances in daphnia, carp, and bullfrogs were determined and compared with literature data. The tests demonstrated that aquatic organisms are sensitive indicators of water pollution and may be considered for practical use in water treatment plants.

77-2285 Nakano, H. (Dep. Food Hyg., Iwate Prefect. Inst. Public. Health, Morioka, Iwata, Japan) **[Results of pesticide residues determination in 1974.]** *Iwate-ken Eisei Kenkyusho Nenpo (Ann. Rep. Iwate Inst. Public Health)* 18: 26; 1975. (Japanese)

In 1974, 21 samples were analyzed for pesticide residues. As compared to the averaged data of 1972 and 1973, the average content of dieldrin in Japanese radish, cucumber and potatoes showed a reduction, respectively from 0.005 to 0.002, from 0.013 to zero and from 0.003 to n.d. (ppm), and that of total BHC in cucumber also showed a reduction from 0.022 to 0.007 ppm. Endrin, found in 2 samples in 1973, was not found at this time. DDT, found only in 2 samples of 60 samples at 0.001 ppm in 1973, was detected in 4 samples in this time at 0.003 - 0.020 ppm. Although dicofol and heptachlor epoxide was detected in one sample each, no organophosphorus or carbaryl was detected.

77-2286 Akhtar, M. H. (Anim. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario, K1A OC6). **Degradation of tetrachlorvinphos and its major metabolite 2,4,5-trichlorophenacyl chloride in aqueous media.** *J. Agric. Food Chem.* 25(4): 848-851; 1977. (11 references)

The degradation of the insecticide tetrachlorvinphos [2-chloro- 2-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate] and its major metabolite, 2,4,5-trichlorophenacyl chloride, was investigated in buffered aqueous media at various pHs. Rate constants and half-life studies revealed that these compounds were stable in acidic and neutral solution but unstable under alkaline conditions. The major mode of decomposition of tetrachlorvinphos in both acidic and basic media is dephosphorylation which results in the formation of 2,4,5-trichlorophenacyl chloride. In alkaline media the chloride undergoes hydrolysis, followed by aldol condensation resulting in the formation of 1-(2,4,5-trichlorobenzyl)-2-(2,4,5-trichlorophenyl) glycerol. (Author abstract reprinted by permission of the American Chemical Society)

77-2287 Merkel, G. J. ; Perry, J. J. (Dep. Microbiol., North Carolina State Univ., Raleigh, NC 27607) **Increased cooxidative biodegradation of malathion in soil via cosubstrate enrichment.** *J. Agric. Food Chem.* 25(5): 1011-1012; 1977. (9 references)

Malathion is biodegraded in soil at an increased rate when suitable cosubstrates are present. Cosubstrates that are initially attacked by a molecular oxygenase, e.g., *n*-heptadecane, are the most effective substrates for cooxidation. (Author Abstract reprinted by permission of the American Chemical Society)

77-2288 Schaefer, C. H. ; Dupras, E. F., Jr. (Mosquito Contr. Res. Lab., Univ. California, Fresno, CA 93727) **Residues of diflubenzuron (1-(4-chlorophenyl) -3- (2,6-difluorobenzoyl) urea) in pasture soil, vegetation, and water following aerial applications.** *J. Agric. Food Chem.* 25(5): 1026-1030; 1977. (4 references)

Diflubenzuron [1-(4-chlorophenyl) -3- (2,6-difluorobenzoyl)urea] was applied to irrigated pastures using liquid (25% wettable powder in water) and granular (1% Attaclay and 1% sand) formulations. Multiple applications of the wettable powder produced high and long-lasting residues on vegetation; these residue levels were reduced but not eliminated using the 1% Attaclay granules. One percent sand granules achieved control of mosquito larvae and no high or persistent residues on vegetation resulted. None of these formulations caused high or persistent residues in soils. (Author abstract reprinted by permission of the American Chemical Society)

77-2289 Pik, A. J. ; Peake, E.; Strosher, M. T.; Hodgson, G. W. (Dep. Chem., Univ. Sydney, Sydney, Australia) **Fate of 3,6-dichloropicolinic acid in soils.** *J. Agric. Food Chem.* 25(5): 1054-1061; 1977. (12 references)

This study in applied research under field conditions determined the fate of the experimental herbicide 3,6-dichloropicolinic acid (DCP) in three alkaline soils (a black chernozem, brown chernozem, and an ortho eutric brunisol) in Alberta, Canada. The herbicide was found to be degraded mainly by microbial means. Degradation rates were fastest in moist soils (t 1/2 approximately 2 months) and were inversely related to the organic carbon content of the soil. The rate of degradation was greatly reduced during both dry and cold periods. Furthermore, after having been in the soil over a winter period, the herbicide gave degradation rates that were further greatly retarded. Thus, although 35% of DCP degraded during the first summer period (the first 3 months after application), only a further 31% degraded during the following 12 months. The extent of leaching of the herbicide was also inversely related to the organic carbon content of the soil, being most pronounced in the brown chernozem and brunisol soils. Predictions for depth of leaching under field conditions, based on a chromatographic model of leaching, were reasonably accurate for the chernozem soils. Adsorption of the herbicide was directly related to the organic carbon content of the soil, thus explaining the relative order of leaching observed. Adsorption distribution coefficients (Kd) were obtained by two independent methods—column leaching and batch-type equilibration of a 1:1 soil/solution slurry—the latter yielding the lower values of 0.12, 0.01, and 0.05 μg DCP/g of soil for the black chernozem, brown chernozem, and brunisol, respectively. (Author abstract reprinted by permission of the American Chemical Society)

77-2290 Kearney, P. C. ; Oliver, J. E.; Helling, C. S.; Isensee, A. R.; Kontson, A. (Agric. Environ. Qual. Inst., Agric. Res. Serv., Beltsville, MD 20705) **Distribution, movement, persistence, and metabolism of *N*-nitrosoatrazine in soils and a model aquatic ecosystem.** *J. Agric. Food Chem.* 25(5): 1177-1181; 1977. (12 references)

[Ring-^{14}C]-*N*-Nitrosoatrazine (II) [2-chloro -4- (*N*-nitroso -*N*- ethylamino) -6- (isopropylamino)-*s*-triazine] was prepared by nitrosating [*ring*-^{14}C]atrazine (I) [2-chloro -4-(ethylamino)-6-(isopropylamino)-*s*-triazine] at 0 C with dinitrogen tetroxide and purified by silica gel column chromatography. The mobility of II, as measured by soil TLC, was only slightly less than that of I in five soils of different texture and organic matter content. When II was held in the dark, it degraded to I in ecosystem water (33% degraded after 9 days and 62% after 18 days). Based on ^{14}C, bioaccumulation ratios (BR) for II in fish were 22 after 9 days and 31 after 18 days. For I, BR values were 17 and 16 after 9 and 18 days, respectively. No formation of II from I was detected (a) after 1, 2, or 3 months in either of two soils treated with 2 ppm I and 0, 100, or 1000 ppn N (as NH_4NO_3), or (b) after 1 month in a soil treated with 2 ppm I and 100 ppm N (NH_4NO_3) maintained at pH's 2.5, 3.5, or 4.5. Transient formation of II from I was observed in an acidic soil amended with 100 ppm N as sodium nitrite. The limit of detection was about 10 ppb for nitrosoatrazine under the experimental conditions described.

77-2291 Sakai, A. ; Tanimura, A. (Natl. Inst. Hyg. Sci., Dep. Food Additives, Setagayu-ku, Tokyo, Japan) **Studies on *N*-nitroso derivatives of *N*-methylcarbamate insecticides (I).** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(2): 164-169; 1977. (11 references)

N-methyl carbamate insecticides have come to be widely used in Japan as replacements for organochlorines. They are transformed in biological and nonbiological media to the *N*-nitroso derivatives. The physicochemical properties of the *N*-nitroso derivatives of the principal carbamates used in Japan, MTMC, MPMC, and carbaryl, were examined. The *N*-nitrosocarbamtes were relatively stable at room temperature in organic solvent in the dark but highly unstable to light. The nitroso derivatives of MTMC and MPMC were completely decomposed when solutions of these in ethanol were exposed to sunlight through glass for 3 hr. Nitrosocarbamate decomposition increased with increasing acidity of solution. A 20% DMSO solution of NO-MTMC (10 mM) maintained at 37°C and pH 5.8 decomposed to the extent of 7% in 1 hr, and at a pH of 1.2 it decomposed by 33% in 1 hr in the dark.

77-2292 Sakai, A. ; Tanimura, A. (Natl. Inst. Hyg. Sci., Dep. Food Additives, Setagaya-ku, Tokyo, Japan) **Studies on *N*-nitroso derivatives of *N*-methylcarbamate insecticides (II).** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Sci. Jpn.)* 18(2): 170-175; 1977. (27 references)

The rates of formation of the nitroso (NO) derivatives of MTMC, and MPMC, with sodium nitrite in aqueous solutions were examined. The initial rate of NO-MTMC formation was proportional to the concentrations of MTMC and sodium nitrite in the range of 2.5-100 mM of MTMC and 25-100 mM of sodium nitrite in aqueous solution at pH 2.0 and 37°C (simulating physiological conditions in the stomach). The initial rates increased with increasing acidity of the reaction mixtures, being almost proportional to the hydrogen ion concentration from pH 3 to pH 1.5. The initial rate of NO-MPMC formation was practically similar to that of NO-MTMC formation at pH 2.0 and 37°C in 20% dimethyl sulfoxide (it was a 1.1 fold multiple).

77-2293 Yoshikawa, S. (Kyoto Munic. Inst. Hyg. Sci., Kyoto, Japan) **[Results of investigations on residues of organotin compounds (dis- and trialkyltin) in commercial foods]** *Kyoto Shi Eisei Kenkyusho Nempo (Annu. Rep. Kyoto Munic. Inst. Hyg. Sci.)* 43: 43-44; 1977. (1 reference) (Japanese)

Residues of trialkyltin pesticides plus tricyclohexyltin hydroxide and its degradation products were determined on/or in 46 market apples, Japanese pears, and potatoes by the method described in vol. 41 of this report (1974). Although a residue standard for tricyclohexyltin hydroxide on/in Japanese pear has been established, no report of such residues has appeared in the Japanese literature. In the present study no residue of the pesticide or its decomposition products was detected nor was triphenyltin or tributyltin.

77-2294 Comer, S. W. ; Robbins, A. L.; Staiff, D. C. (U.S. Environ. Protect. Agency, Field Studies Section, P.O. Box 219, Wenatchee, WA 98801) **Potential exposure from smoking parathion-contaminated cigarettes.** *Arch. Environ. Contam. Toxicol.* 6(1): 103-110; 1977. (6 references)

Pesticides workers usually contaminate their cigarettes with less than 100 μg per cigarette by handling them, but in some instances such contamination has been found to be over 200 μg. To obtain values for potential exposure resulting from smoking contaminated filter tip and nonfilter cigarettes, from 10 to 200 μg of parathion was applied to the cigarette surface area found to be most often contaminated by hands. This was followed in two separate experiments by simulated smoking using a special apparatus to determine (1) passage of toxic material through cigarettes in mainstream smoke, (2) amount found in sidestream smoke, (3) amount trapped in the filter or eqiuvalent butt end, and (4) amount recovered in ashes. The amount of parathion passing through cigarettes as a potential for inhalation exposure ranged up to 28% of dosing levels. No paraoxon or *S*-ethyl parathion was detected. Although there was an indication that slightly more pesticide was recovered from filters than from equivalent butt ends, the amount recovered in mainstream smoke of filter type cigarettes was not significantly lower than for nonfilter cigarettes. Location of contamination on a cigarette had minimal effect on the amount found in mainstream smoke. (Author abstract by permission)

77-2295 Shcherbatyuk, L. K. ; Bondarev, V. P.; Golovin, V. V. ("Magarach" Sci. Res. Inst. Viticult. Enol., USSR)

Ostatochnaia fitotksichnost' piklorama v usloviiahk iuga Ukrainy. [Residual phytotoxicity of tordon under the conditions prevailing in southern Ukraine.] *Khim. Sel. Khoz.* 15(3): 58-59; 1977. (5 references) (Russian)

The residue dynamics of tordon (picloram) was studied by determining its phytotoxic effect in soil using sensitive indicator plants. Preliminary tests revealed growth retardation of bean plants in soil containing 1 μg of tordon per kg of dry soil, and total depression and death of the plants in soil containing 10 μg of tordon per kg. Field tests on slightly alkaline chestnut soil with 2% humus revealed considerable amounts of tordon, especially in the 30-90-cm layers, 4 years after the application of tordon at expenditures of 0.6 and 1 kg/ha. No phytotoxic effect on bean plants was observed 4 years after the application of 0.3 kg/ha. Experiments in a vineyard with dark chestnut fine loamy alkaline soil with 2% humus showed normal development of potato and fodder beet plants 4 years after application of 0.2 kg/ha, slight epinasty of the leaves in some plants after the application of 0.5 kg/ha, growth depression and pronounced epinasty of the leaves 4 years after application of 1 kg/ha, and the death of all plants after application of 2 kg/ha. The findings indicate that soils treated with 0.5 kg/ha tordon should not be used for grape, potato, beet and bean growing.

77-2296 Gergaia, M. S. ; Bezhanidze, A. A. (TsINAO, Tbilisi Branch Office, Tbilisi, USSR) **Dinamika razlozheniia pestitsidov v selenykh list'iakh chaia. [Dynamics of the decomposition of pesticides in green tea leaves.]** *Khim. Sel. Khoz.* 15(3): 75-77; 1977. (8 references) (Russian)

The residue dynamics of Bi-58 (dimethoate, applied in a dose of 10 kg/ha), malathion (20 kg/ha), phosalone (20 kg/ha), benzophosphate (15 kg/ha), and carbaryl (15 kg/ha) was studied in tea leaves during the first 30 days after spraying. Malathion and Bi-58 were detectable in the tea leaves for 12 days, phosalone for 15 days, carbaryl for 25 days, and benzophosphate for 30 days. The infusion of tea leaves harvested 30 days after treatment had normal organoleptic properties. The findings indicate that the necessary waiting times between pesticide application and harvesting should be 22 days for malathion and BI-58, 25 days for phosalone and benzophosphate, and 30 days for carbaryl.

77-2297 Lindsay, R. C. ; Stuiber, D. A. (Univ. Wisconsin, Madison, WI) **Evaluation of food processing methods for Great Lakes anadromous fish.** *Natl. Tech. Inform. Serv.* COM-75-10508, 9 p.; 1975.

The report investigates the food quality of Lake Michigan Coho and Chinook salmon during three consecutive harvest seasons (1971-1973). While compositional and quality factors vary among individual specimens within seasonal harvests, the general quality and overall characteristics of fish from the three years are similar, and thus can be considered reasonably predictable. The processing of salmon is studied in this report; the areas of canning, smoking, kippering, and freezing are given special attention. Off-flavors in the Great Lakes salmon and PCB and DDT residues pose the most serious problems to potential commercial utilization of the salmon resource. Suggestions for improving or alleviating these problems are given. (Author abstract by permission)

77-2298 Vind, H. P. ; Mathews, C. W. (Civil Eng. Lab., U.S. Navy, Port Hueneme, CA) **Biodeterioration of Navy insecticides in the ocean.** *Natl. Tech. Inform. Serv.* AD-A007,568, 9 p.; 1975.

Based on the results of previous effort in this investigation of the biodeterioration of insecticides in the ocean, it was hypothesized that the water-insoluble chlorinated insecticides are transported in sea water primarily by being absorbed in the fatty cell membranes of microorganisms suspended in the water. The hypothesis predicts that insecticides somewhat less fat-soluble than DDT will not enter the ocean food chain as readily as DDT. They would not be as hazardous as DDT and yet might be just as toxic and persistent. The hypothesis also predicts that insecticides in sewage can be removed with the microbial cells in a primary or secondary treating plant. At the Civil Engineering Laboratory several experiments are underway to determine the validity of the hypothesis.

77-2299 Rogers, C. J. ; Landreth, R. E. (Natl. Environ. Res. Ctr., Cincinnati, OH) **Degradation mechanisms: controlling the bioaccumulation of hazardous materials.** *Natl. Tech. Inform. Serv.* PB-240,748, 21 p.; 1975.

Numerous toxic and hazardous compounds are being generated for commercial, industrial and agricultural uses. Most of these materials are eventually released into the environment. This study documented the existence of biological, chemical and physical transformation processes of hazardous wastes in the environment. It was determined that the rates of transformation of these hazardous materials, when applied and/or discharged to the environment, are slow. Case studies confirmed that persistency of certain hazardous materials results in the bioaccumulation of residues in living systems. A lack of knowledge of the fate and clinical manifestation of persistent residues in living systems dictates the need for implementation of the described scheme of control technology. (Author abstract by permission)

77-2300 Sugiyama, S. ; Yamada, T.; Hoda, H.; Mitsukuni, Y.; Yoshimura, M. (Sch. Leg. Med., Fac. Med., Kinki Univ., Osaka, Japan) **[Forensic-medical studies on pesticide residues in human body part II. DDT.]** *Nippon Hoigaku Zasshi (Jpn. J. Leg. Med.)* 31(3): 126-135; 1977. (13 references) (Japanese)

DDT and its metabolites were determined by microcoulometric gas chromatography on 126 human adipose tissue samples and 62 liver samples obtained from forensic autopsies between 1974 and 1975. In adipose tissue, the residual concentration of total DDT (fat basis) ranged from 0.14 to 4.72 ppm with an average of 1.63 1.25 ppm in the less than 1 year old group (25 samples), from 0.18 to 7.31 ppm with an average of 2.21 1.48 ppm in the 1-19 year old group

(42 samples), from 0.69 to 12.97 ppm with an average of 4.71 2.77 ppm in the 20-49 year old group (35 samples), and 1.34 to 10.31 ppm with an average of 444 2.15 ppm in the over 50 year old group (24 samples). In the liver, the DDT content (fat basis) ranged between 0.38 and 5.28 ppm, with an average of 2.06±1.62 ppm in the 1-19 year old group (21 samples), 0.48 - 7.78 ppm with average of 4.30±1.89 ppm (18 samples) in the 20-49 year old group, and 0.75-20.46 ppm with an average of 6.44±5.14 ppm (12 samples) in the over 50 year old group. The concentrations of *p,p'*-DDE, *p,p'*-DDT, and *p,p'*-DDD were about 75-85%, about 15-20%, and almost zero, respectively, of that of total DDT in the adipose tissue; and thus were about 55-65%, about 10-20% and about 20-30% of the concentration of total DDT in the liver. No differences in these concentrations were found between sexes (for adults). Transplacental migration was recognized from mother to fetus.

77-2301 Shiga, N. ; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan) **Disappearance of diazinon in soil under various experimental conditions.** *J. Pestic. Sci.* 2(3): 315-318; 1977. (1 reference) (Japanese)

Disappearance of diazinon in flooded soil was tested in order to estimate the dependence of persistence of diazinon in soil on the type of formulation of the insecticide. Flooded soil was prepared for the experiments by weighing 20 g of dried soil into a vessel and flooding with about 1 cm of water. A solution of diazinon was either mixed with the flooded soil or added to the surface of the flooding water. In another test, the acetone solution was adsorbed on bentonite granules, which were then placed on the surface of the flooded soil. The vessels were left in an incubator at 30°C, the loss of diazinon being measured periodically by gas chromatography. It was found that the rate of diazinon loss was a little smaller in the case where diazinon was added on the surface of the water than in other cases. In a larger apparatus (1 x 4m) the rate of diazinon was applied in a model paddy field in the apparatus. Thus, it was found that the persistence of diazinon in soil shows little dependence on the type of formulation.

77-2302 Serat, W. F. ; Lee, M. K.; Von Loon, A. J.; Mengle, D. C.; Ferguson, J.; Burks, J. M.; Bender, T. R. (EPA, Washington, DC) **DDT and DDE in the blood and diet of Eskimo children from Hooper Bay, Alaska.** *Pestic. Monit. J.* 11(1): 1-4; 1977. (15 references)

An analysis of the levels of DDT and DDE in the blood of some Alaskan Eskimo children and in the fat of some local marine mammals taken for food suggests that the children's pesticide burden is only modestly lower than that of other American children. Authors suggest that some other food source, perhaps packaged food, supplies a portion of the dietary chlorohydrocarbon pesticide. (Author abstract by permission)

77-2303 Walsh, D. F. ; Berger, B. L.; Bean, J. R. (Fish Wildl. Serv., U.S. Dep. Int., Atlanta, GA 30329) **Mercury, arsenic, lead, cadmium, and selenium residues in fish, 1971-73—National Pesticide Monitoring Program.** *Pestic. Monit. J.* 11(1): 5-34; 1977. (14 references)

As part of the National Pesticide Monitoring Program, the Fish and Wildlife Service, U.S. Department of Interior, analyzed selected fish samples from 100 monitoring stations for residues of mercury, arsenic, lead, cadmium, or selenium in 1971-73. At most stations, detectable residues of all metals were present in more than 95 percent of the composite samples. Fishes with mercury were mainly predators. Fishes with residues of arsenic, lead, cadmium, and selenium exceeding 0.5 mg/kg included predatory and nonpredatory species. The number of composite samples in which residues of these elements exceeded 0.5 mg/kg decreased from 1971 to 1973, whereas the percentage of samples with detectable residues increased slightly. Only selected samples were analyzed in 1973; therefore, these figures should be used only cautiously as trend data. Species of fish collected varied considerably between geographic regions but were similar from year to year within each region. (Author abstract by permission)

77-2304 White, D. H. ; Bean, J. R.; Longcore, J. R. (Fish Wildl. Serv., U.S. Dep. Int., Patuxent Wildl. Res. Cent., Gulf Coast Field Stn., P.O. Box 2506, Victoria, TX 77901) **Nationwide residues of mercury, lead, cadmium, arsenic, and selenium in starlings, 1973.** *Pestic. Monit. J.* 11(1): 35-39; 1977. (10 references)

Starlings (*Sturnus vulgaris*) collected in 1973 at 51 sites throughout the continental United States were analyzed for mercury, lead, cadmium, arsenic, and selenium. All samples contained detectable levels of these elements. In general, residues were low: mercury residues ranged from < 0.01 to 0.20 ppm; lead, from < 0.10 to 3.20 ppm; cadmium, from < 0.05 to 0.20 ppm; arsenic, from < 0.05 to 1.40 ppm; and selenium, from 0.10 to 1.10 ppm. There was a significant overall decline in mercury and lead residues in starlings since 1971, and a significant increase in arsenic residues. Lead residues were significantly higher in starlings from urban areas than from rural areas. (Author abstract by permission)

77-2305 Blus, L. J. ; Neely, B. S., Jr.; Lamont, T. G.; Mulhern, B. (Fish Wildl. Serv. U.S. Dep. Int., Patuxent Wildl. Res. Cent., Laurel, MD 20811) **Residues of organochlorines and heavy metals in tissues and eggs of brown pelicans, 1969-73.** *Pestic. Monit. J.* 11(1): 40-53; 1977. (34 references)

Shells of brown pelican (*Pelecanus occidentalis*) eggs collected in South Carolina from 1969 through 1973 were significantly thinner than shells of those collected before 1947. Residues of 10 organochlorine pollutants and 10 heavy metals were found in these eggs. Total organochlorine residues were apparently magnified 23 times from fish to pelican eggs, but interpretation of biomagnification was complicated by the migratory habits of both the pelicans and their chief prey fish. Residues of organochlorine pollutants and heavy metals were also found in tissues of brown pelicans. Dieldrin

was probably involved in the death of a pelican that exhibited myocardial necrosis. Other pelicans died from gunshot wounds, various dieseases, or unknown causes. From 1969 through 1973, there was a significant decline in residues of *p,p'*-DDE, *p,p'*-TDE, *p,p'*-DDT, and dieldrin in eggs of the brown pelican in South Carolina, but the rate of decline was different for each pollutant. PCB's peaked in 1972 and then declined in 1973 to the lowest level in 5 years. In 1973, the first time in many years, South Carolina brown pelicans reproduced very well. The excellent reproductivity seemed related to lowered organochlorine residues and favorable tides, weather, and food supply. (Author abstract by permission)

77-2306 Reiner, E. ; Krauthacker, B.; Stipcevic, M.; Stefanac, Z. (Inst. Med. Res. Occup. Health, Yugoslav Acad. Sci. Arts, 41000 Zagreb, Yugoslavia) **Blood levels of chlorinated hydrocarbon residues in the population of a continental town in Croatia (Yugoslavia).** *Pestic. Monit. J.* 11(1): 54-55; 1977. (4 references)

Plasma or serum samples of 147 individuals from the general population of a continental town in Croatia (Yugoslavia) were analyzed for chlorinated hydrocarbons in 1975. The compounds were determined by gas chromatography and identified by comparing their retention times with those of known standards. All samples contained *p,p'*-DDE; mean concentration was 35.3 ppb. Only 20 samples contained *p,p'*-DDT; mean concentration was 22.7 ppb. Concentrations of α-BHC, lindane, and *p,p'*-TDE were 3.25, 4.09, and 11.6 ppb, respectively. (Author abstract by permission)

77-2307 Darda, S. ; Darskus, R. L.; Eichler, D.; Ost, W.; Wotschokowsky, M. (C. H. Boehringer Sohn, 6507 Ingelheim/Rhein, Germany) **Hydrolysis and photolysis of the fungicide triforine** *Pestic. Sci.* 8(3): 183-192; 1977. (23 references)

The main decomposition products formed from triforine by hydrolysis in solution and by photolysis were isolated and identified. In aqueous solution at 21°C, hydrolysis proceeds rapidly by formation of chloride ions and, through several intermediates, 1-(dihydroxyacetyl) piperazine and piperazine. Photolysis by ultraviolet light in the absence of water leads preferentially to the removal of one side chain, the second side chain being attacked more slowly. In aqueous solution, triforine is rapidly destroyed by ultraviolet light. *N*-(2,2-Dichlorovinyl) formamide was isolated as an intermediate photodecomposition product. (Author abstract by permission)

77-2308 Maslennikova, V. I. ; Vodianov, A. A. (Stavropol Institute of Agronomics, Stavropol, USSR) **O raspredelenii geksakhloranovykh emul'sii v pochve. [Distribution of hexachlorane (BHC) emulsions in the soil.]** *Veterinariya* (6): 65-70; 1977. (Russian)

The vertical and horizonal migration of lindane from sheep dip discharged in percolation ditches was studied in different types of soil. The initial lindane concentration in the water was 0.018-0.022%. In calcareous micellar chernozem, lindane was detectable in the soil to a maximum depth of 100-120 cm, and the concentration was reduced by 92.5% at 100 cm distance horizontally. Lindane was not detectable at 200 cm distance. Lindane was detected to a depth of 150 cm and at a maximal horizontal distance of 300 cm in light chestnut loamy soil. In light chestnut sandy loam, the maximal depth of penetration was 200 cm, the maximal horizontal distance 500 cm. The findings indicate that percolation ditches offer effective protection against the spread of lindane from suspensions.

See also 77-2342 77-2348 77-2350 77-2359 77-2361 77-2373 77-2386 77-2387 77-2422 77-2438 77-2440 77-2512 77-2513 77-2514

77-2309 Sugaya, T. ; Hayashi, S.; Ito, S.; Suzuki, T.; Kimura, M.; Hayashi, M.; Kurokawa, S. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan) **[Results of health examinations on pesticide applying farmers.]** *Akita-Ken Noson Igaku Kenkyusho Nempo (Annu. Rep. Inst. Rural Med., Akita)* 4: 23-26; 1974. (Japanese)

From June to August 1974, twenty-three pesticide sprayers were examined in Nakayama, Akita Prefecture. Eleven of the 26 persons who applied pesticides complained of illness 236 times in June and July. The pesticides responsible for the symptoms were organochlorines, organophosphates, and *N*-methylcarbamates. The medical examinations revealed four cases of false positive proteinuria, one urine positive for *para*-nitrophenol, three critical RBC, two abnormal hemoglobin, three critical hemoglobin, five critical hematocrit value, four critical proteinemia, average serum cholinesterase of 0.67 with seven cases less than 0.6, a contact dermatitis, two dermal atrophy, and seven cases of deformed nails. There was one case each of abnormal GOT and GPT, suggesting liver impairment.

77-2310 Sugaya, T. ; Wakatsuki, S. (Pesticide Intoxication Group, Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan) **[Clinical studies on intoxication due to pesticides. Studies on the clinical cases throughout Japan of intoxication due to pesticides, 1974.]** *Akita-Ken Noson Igaku Kenkyusho Nempo (Annu. Rep. Inst. Rural Med., Akita)* 4: 27-41; 1974. (Japanese)

In 1974, 28 hospitals in rural areas of Japan reported 174 cases of pesticide poisoning, which is similar to the figures for the previous five years; 60.9% of these cases involved occupational exposure. The incidence of female poisonings exceeded those in males by a ratio of 31:10.This may be due to the increased number of women spraying or contacting pesticides. A higher frequency of pesticide poisoning was reported during the application season of May through August. The most frequently used pesticides were: organophosphates, herbicides, organosulfur fungicides, organochlorines, and *N*-methylcarbamates. The application of low toxicity organophosphates and banned or restricted pesticides caused acute intoxication symptoms. Factors contributing to the intoxication of workers were: poor general health, inadequate protective clothing, and premature reentry into recently sprayed fields. Twenty-five of the reported cases included accidental or intentional ingestion of pesticides. This resulted in 11 deaths, six of which were due to paraquat dichloride.

77-2311 Sugaya, H. (Pesticide Intoxication Research Group, Akita Prefecture, Japan) **[Studies on pesticide intoxication in Akita prefecture. Clinical investigation of pesticide intoxication: 1974, 1975, 1976.]** *Akita-Ken Noson Igakkai Zasshi (Akita J. Rural Med.)* 23(2): 1-5; 1977. (5 references) (Japanese)

Cases of pesticide intoxication in Akita prefecture are reported. The symptoms included: headache, vomiting, dizziness, sweating, spasms, skin disturbances, eye and nasopharyngeal irritations, accidental and intentional ingestion, allergies, and suspected cases of chronic intoxication. The number of cases per year are: 55 in 1967, 76 in 1968, 80 in 1969, 51 in 1970, 51 in 1971, 73 in 1972, 46 in 1973, 43 in 1974, 28 in 1975, and 323 in 1976. In 1974 ten organophosphates, four herbicides, three *N*-methyl carbamates, three *N*-methyl carbamates, three organomercurials, and three antibiotic intoxications were reported. The percentages of poisonings due to pesticide application were: 58% in 1974, 50% in 1975, 25% in 1976. Accidental poisonings, attempted suicides, and suicidal deaths numbered 3, 9, and 4 in 1974; 1, 6, and 1 in 1975; and 1, 7, and 2 in 1976.

77-2312 Hanada, K. ; Kameda, T.; Suzuki, Y.; Kayashi, S.; Ohogi, A.; Sugaya, H. (Lab. Rural Med., Hiraga Gen. Hosp., Akita, Japan) **[An investigation of patch test dermatitis. Part IV: a comparison between farmers and non-farmers.]** *Akita-Ken Noson Igakkai Zasshi (Akita J. Rural Med.)* 23(2): 6-8; 1977. (4 references) (Japanese)

Farmers (36 women) and non-farmers (40 women) were administered eleven pesticide patch tests. The percentage of positive results for farmers was: fenitrothion (0), diazinon (0), chlorobenzilate (2.8%), chlorothalonil (91.7%), zineb (2.8%), paraquat dichloride (2.8%), nitrofen (22.2%), captafol (36.1%), benomyl (11.1%), thiophanate (22.2%), and Blasticidin S (30.6%). The positive results for non-farmers were: fenitrothion (7.5%), diazinon (17.5%), chlorobenzilate (15%), chlorothalonil (72.5%), zineb (7.5%), paraquat dichloride (0), nitrofen (10%), captafol (30%), benomyl (0), thiophanate (10%), and Blasticidin S (25%). The percentage of farmers with a pesticide application history was: chlorothalonil (2%), paraquat dichloride (1%), nitrofen (1%), captafol (4%), and thiophanate (3%). In another series of experiments, the response to pressure patch tests was compared to results of ordinary patch tests administered to the farmers without pesticide application history. In twelve cases the pressure patch test had a stronger response, three cases had a weaker response, and in twenty-one cases there was no difference. These tests were performed in the orchard and rice fields of south Akita. In this area the four most frequently used pesticides are fenitrothion, zineb, monox and captafol.

77-2313 Sasaki, S. ; Miura, A.; Takahashi, K.; Yoshida, H.; Kondo, M. (Dep. Local Health Activ., Yuri Coop. Gen. Hosp., Yuri, Akita, Japan) **[Results of investigations on the current status of pesticide intoxication in Honjo, Uri area, Akita prefecture.]** *Akita-Ken Noson Igakkai Zasshi (Akita J. Rural Med.)* 23(2): 9-14; 1977. (Japanese)

A questionnaire pertaining to pesticide toxicity was distributed to 3,850 persons on rice farms in Honjo, Yuri, Akita Prefecture. Nine hundred eighty-one men and 971 women replied; 91% and 76% respectively came into contact with pesticides. Pesticides were applied 1-9 times per year, with the peak application time in July. The vast majority of persons interviewed wore boots and long sleeved garments during pesticide application; however, only 4% wore dustproof goggles. During and after pesticide application, 16% of the men and 23% of the women felt ill. The symptoms

were: headache, nasopharyngeal discomfort, fatigue, ocular impairment, nausea, vomiting, skin rash, impaired breathing, and in two cases, loss of consciousness. Only 8% of those who were ill consulted a physician. The pesticides responsible for these illnesses are: fenitrothion, Kitazin P (IBP), PCP, oxadiazon, molinate plus simetryne, MCPA, nitrofen, and kasugamycin plus fenitrothion.

77-2314 Diggory, H. J. P. ; Landrigan, P. J.; Kimbrough, R. D.; Latimer, K. P.; Liddle, J. A.; Ellington, A. C.; Cline, R. E.; Smrek, A. L. (CDC, Atlanta, GA 30333) **Fatal parathion poisoning caused by contamination of flour in international commerce.** *Am. J. Epidemiol.* 106(2): 145-153; 1977. (22 references)

A parathion outbreak of epidemic proportions occurred in Jamaica in January 1976. Of the 79 victims reported, 17 died. Although the cases occurred in three episodes in separate towns in southeastern Jamaica, all had consumed wheat flour from a single lot of 5264 cotton bags. In this lot six bags of flour were examined for contamination; three of these had splash marks. Parathion concentrations of < 1 to 9900 ppm were identified in the flour samples. The flour had been milled in Western Europe from European wheat and stored dockside in warehouses for 2-5 days, then loaded aboard ship. These warehouses were also used for insecticide storage. In Jamaica, two import houses transported the flour from the waterfront to the outbreak locations. Site inspection and review of the shipping records suggest that contamination occurred in the European port.

77-2315 Smysl, B. ; Smyslova, O.; Kosatik, A. (Abt. Rechtsmed., Fakultaetskrankenhaus, 77509 Olomouc, Czechoslovakia) **[Acute fatal ioxynil intoxication.]** *Arch. Toxicol.* 37(3): 241-245; 1977. (3 references) (German)

An accidental fatal intoxication by Ioxynil is reported. Relevant autopsy findings are given and an extraction procedure for the determination of Ioxynil in the fluid ingested and in autopsy material is described. In the unknown fluid Ioxynil has been identified by using IR and NMR spectroscopy and determined by UV spectrophotometry. In biological material Ioxynil has been identified by TLC and IR spectroscopy. For the determination in blood serum, TLC-densitometry in situ has been carried out. (Author abstract by permission)

77-2316 Hill, R. (Roy. Vet. Coll., Boltons Park, Potters Bar, Herts., England) **Copper toxicity. I.** *Br. Vet. J.* 133(3): 219-224; 1977. (53 references)

Copper toxicity in animals has been the subject of study for many years, but new potential occurrences of copper poisoning are initiated by new trends in animal production. Findings on copper toxicity, especially in the past 10 years, are reviewed. Sources of copper include its direct application to plants, animals, and facilities to prevent and treat disease and pest infestations. Copper may also be accumulating in soil as a result of application of organic wastes to herbage. The chief clinical and postmortem feature of chronic copper poisoning in sheep, cattle, and pigs is jaundice; in sheep and cattle this is associated with sudden development of methemoglobinemia and hemoglobinuria.

77-2317 Dennis, W. H., Jr. ; Cooper, W. J. (US Army Med. Bioeng. Res. Dev. Lab., Fort Detrick, Federick, MD 21701) **Catalytic dechlorination of organochlorine compounds III. Lindane.** *Bull. Environ Contam. Toxicol.* 18(1): 57-59; 1977. (8 references)

In situ preparation of nickel boride by the addition of excess sodium borohydride to alcoholic nickel chloride was found to be effective in the extensive dechlorination of DDT, heptachlor, and chlordane. Dechlorination of lindane in this catalytic system was examined. Nickel boride reduction of lindane was carried out by adding sodium borohydride solution dropwise to a methanolic solution of lindane and nickel chloride. After 30 min the reaction mixture was analyzed by gas chromatography, mass spectrometry, and potentiometric titration of chloride. Ethanol and 2-propanol promoted the reaction, as did methanol, while water hindered it. In each case benzene was the major reaction product, and the chloride yield in the various solvents was between 94 and 100%. In the presence of methanolic sodium hydroxide lindane produced the expected isomeric trichlorobenzenes, but trichlorobenzenes were not observed using sodium borohydride in methanol in the absence of nickel boride. Unidentified tetrachloro and pentachloro compounds were observed during gas chromatography. It appears that the reduction of lindane in the system examined does not proceed through the trichlorobenzene intermediates.

77-2318 Swensson, A. ; Kolmodin-Hedman, B. (Dep. Occup. Med., Karolinska Hosp., Stockholm, Sweden) **Studies on lindane in forestry.** *Bull. Inst. Mar. Med. Gdansk* 28(1-2): 53-56; 1977. (8 references)

DDT was used to control the large brown pine weevil, *Hylobius abietes*, in Sweden until 1970. Upon the prohibition of DDT, treatments with lindane were substituted. Lindane is a volatile organochlorine insecticide which penetrates the skin easily. Plasma levels of lindane were studied in four groups of personnel: mixers, sprayers, packers, and planters. A plasma lindane concentration of 10 ng/ml induced liver microsomal enzymes. In rats this effect occurs at levels of 20-40 ng/ml. Induction by DDT occurs at plasma concentrations of 200 ng/ml. The risk of lindane absorption into the body appears greater than the risk of action of DDT under corresponding conditions. Therefore, more preventive measures must be taken to prevent the entry of lindane into the body.

77-2319 Zegarski, W. ; Wisniewska, W.; Krasnowiecki, A.; Swica, P. (Inst. Intern. Dis., Med. Acad. Gdansk, Poland) **Acute intoxications, a medical and social problem.** *Bull. Inst. Mar. Med. Gdansk* 28(1-2): 89-98; 1977. (10 references)

In Poland the acute intoxication incidence amounted

to 9.5 per ten thousand inhabitants in 1968; 22,000 cases required hospitalization. In 1974 the number of cases hospitalized amounted to almost 40,000. Progress in clinical toxicology has permitted a considerable reduction of the death rate in acute intoxications, but poisoning prevention requires an epidemiologic and sociologic approach. Treatment of poisoning is complicated by the fact that the poisons are often known by trade names. There are eight regional toxicology centers in Poland, performing informational, consultative, and analytical functions. One of these centers is located at the Medical Academy in Gdansk, and has afforded the collection of statistics. Between 1961 and 1970, 521 patients with acute intoxications were hospitalized in the clinic. In the next five years 454 cases were treated. Half of the patients were suitable for ambulatory treatment. The number of suicides has clearly increased in the reporting period, compared to occupational and accidental poisoning. Pesticide poisoning accounted for 3.5% of the suicide attempts, 6.9% of the accidental cases, and 4.8% of the total cases.

77-2320 Ng, R. C. W. (Poison Inform. Ctr., Hosp. Sick Children, Toronto, Ontario M5G 1X8, Canada) **Acute poisoning: an update.** *Can. Med. Assoc. J.* 117(4): 370-372; 1977. (14 references)

The incidence of accidental poisoning in children has decreased in the past few years, but drug misuse and suicide attempts continue. If the poison ingested is unknown support of vital functions is of prime importance. Early recognition of signs indicating poisoning by specific chemicals is essential since specific antidotes may be lifesaving. Activated charcoal adsorbs many common drugs. Vomitus, lavage aspirates, and blood and urine samples should be collected for toxicologic analysis, although this may be time consuming and available only in large medical centers. Organic phosphate insecticides are among the major poisons encountered, for which symptoms, antidotes, and management are outlined.

77-2321 Reichert, E. R. ; Yauger, W. L., Jr.; Hattis, R. P.; Rashad, M. N.; Klemmer, H. W. (Hawaii Epidemiol. Stud. Program, Pacific Biomed. Res. Cent., Univ. Hawaii, Honolulu, HI) **Diazinon poisoning in eight members of related households.** *Clin. Toxicol.* 11(1): 5-11; 1977. (8 references)

Diazinon has been shown to be responsible for the acute poisoning of eight members of two related families. The historical and analytical evidence shows that the poisoning was the result of the misuse of a 25% diazinon insecticide formulation inside the home, and that contaminated oatmeal was the chief source of poison intake. The absence of high levels of metabolites in the urine of the poisoning victims indicates that decontamination of the household environment was effective and that exposure to diazinon was diminished. (Author abstract by permission)

77-2322 Morgan, D. P. ; Dotson, T. B.; Lin, L. I. (Dep. Prev. Med. Environ. Health, Univ. Iowa Med. Sch., Iowa City, IA) **Effectiveness of activated charcoal, mineral oil, and castor oil in limiting gastrointestinal absorption of a chlorinated hydrocarbon pesticide.** *Clin. Toxicol.* 11(1): 61-70; 1977. (13 references)

Neither activated charcoal, castor oil, nor mineral oil reliably limited the gastrointestinal absorption of instilled lindane, a typical chlorinated hydrocarbon pesticide. Test methods allowed for too much variation in response to permit demonstration of beneficial effects, if they exist. Failure to demonstrate such benefit does not, of course, establish that use of these agents is entirely without advantage. Of the regimens tested, the more modest doses of charcoal and castor oil appeared to offer the most promise. It is important to minimize addition of fluid to the gastric contents when administering agents intended to limit absorption. Adequate anticonvulsant medication in poisonings by chlorinated hydrocarbons may serve to delay, and possibly to reduce, toxicant absorption by limiting the dispersion that occurs as a result of gastrointestinal motility, excitement, and seizure activity. (Author abstract by permission)

77-2323 Klemmer, H. W. ; Budy, A. M.; Takahashi, W. (Hawaii Epidemiol. Stud. Program, Pacific Biomed. Res. Cent., Univ. Hawaii, Honolulu, HI) **Human tissue distribution of cyclodiene pesticides—Hawaii 1964-1973.** *Clin. Toxicol.* 11(1): 71-82; 1977. (6 references)

Data have been presented covering symptoms of acute exposure to cyclodiene pesticides in adults and infants in Hawaii. Varying concentrations of heptachlor epoxide, dieldrin, DDT, DDE, and DDD were found in human autopsy material, with the highest levels of heptachlor epoxide in bone marrow and liver and those of dieldrin in kidney and gonad. Maximum concentration of dieldrin in human milk was 0.25 ppm on an extracted lipid basis; in fetal tissues, 1.46 ppm; and in maternal tissues, 2.04 ppm. There was a correlation between dieldrin concentration in household dust and human blood serum. The general baseline levels of cyclodiene pesticides were lower in Hawaii than the rest of the United States. (Author abstract by permission)

77-2324 Behnam, B. ; Al-Saleem, T. (Dep. Dermatol. Pathol., Med. City, Baghdad, Iraq) **Skin manifestations of mercury poisoning.** *Contact Dermatitis* 3(3): 113-114; 1977. (1 reference)

An outbreak of methylmercury poisoning occurred in Iraq. This was the result of handling and ingestion of treated grain and home-made bread. A report is presented of eight patients suffering from skin lesions. The principal manifestations were exfoliative dermatitis with pigmentation, follicular hyperkeratoses, flexural exudation and fissuring. These changes are believed to be due to direct skin contact with the treated seed and percutaneous absorption rather than by oral ingestion. The primary sites affected by methylmercury exposure were the hands, forearms, face, trunk and legs. One patient was treated with a high protein diet, intramuscular injections of procaine penicillin and vitamin B complex and oral administration of ascorbic acid. Oily calamine lotion was the only local application. He made a complete recovery apart from slight residual brown pigmentation.

77-2325 Anonymous. **A trojan horse named RPAR.** *Farm Chem.* 140(8): 13-22; 1977.

The guidelines on registration, reregistration, and classification of pesticides issued by the Environmental Protection Agency in July 1975 contained a section on criteria for determinations of unreasonable adverse effects. This section in turn contains a procedure known as RPAR, for Rebuttable Presumption Against Registration, which is intended to serve as a warning when there are positive indications that a pesticide might have adverse effects on man and the environment. The present report contends that this procedure is being applied unfairly, since a single report that a compound exceeded the criteria specified will place the product on the suspect list. If a presumption of hazard is not rebutted the pesticide may be lost to agriculture unless the benefits are proven to outweigh the risks. As of June 28, 1977, RPAR notices had been issued on 16 pesticides; there are currently 44 other compounds on pre-RPAR review. According to the RPAR procedure benefits are not considered until after risk has been established. Furthermore only sound scientific evidence is considered in rebuttal of risk, while strict criteria do not exist for presumption of risk. A hopeful possibility for fair evaluation is seen in the planned assessment of findings by the EPA Science Advisory Panel, nominated by the National Institutes of Health and National Science Foundation.

77-2326 Sato, C. (Yokohama, Kanagawa Prefecture, Japan) **[Criticism on the recent theory of myopia. Part 5. Principles of countermeasures against acquired myopia.]** *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 71(8): 1028-1029; 1977. (Japanese)

Acquired myopia has been assumed to develop in a sequence of continued regulation, tonus, and organic alteration; the first mentioned is more easily treated. Although all acquired myopia can be prevented and may possibly be curable, the countermeasures should be continued for a long term. The experimentally developed myopia in experimental animals due to organophosphorus pesticides could not be linked to clinically observed symptoms of human myopia. Based on the observation on fundus, visual field, reaction to atropine eyedrops, distribution of refraction, and percentage of myopia in the population in rural and urban areas it is impossible to say that organophosphorus insecticides are among the major causes of the currently prevailing myopia. When large amounts of organophosphorus insecticide are administered to animals such as monkeys, myopia will be caused, e.g., when eserine was administered continuously as eyedrops. However, evidence is insufficient to conclude that recent increases in myopia are due to organophosphorus pesticides.

77-2327 Matsumoto, N. (Sch. Pub. Health, Fac. Med., Tokyo Univ., Tokyo, Japan). **[Environmental pollutants and congenital anomalies.]** *Igaku No Ayumi (Progr. Med.)* 100(1): 211; 1977. (4 references) (Japanese)

It has recently been recognized that because of the increasing contact of humans with various chemicals consideration must be given to protecting not only the present generation but also the following generations. The article focuses on the problems of the relationship between chemical substances as environmental pollutants and congenital anomalies. Examples in which this relationship have become evident include the connections between lead and abortion or premature death, fetal Minamata disease due to methylmercury, and rice-oil disease in newborns due to PCB. It is very important to establish an international scientific and administrative standard for recording and reporting cases of congenital anomalies. It is also necessary to make clear the types and distribution of environmental pollutants and evaluate their biological effects by examining their acute and chronic toxicity, carcinogenicity, teratogenicity, and mutagenicity.

77-2328 Smith, D. M. (Health Safety Exec., Gov. Bldgs., Worcester WR5 2LJ, England) **Health care of people at work: agricultural workers.** *J. Soc. Occup. Med.* 27(3): 87-92; 1977. (8 references)

Chemicals are a major hazard in agriculture. About 5000 agriculture related accidents and 200 cases of occupational illness are reported each year in Great Britain. Approximately 20 cases of poisoning from agricultural chemicals are reported each year. Pesticide usage, protective clothing, work hours, notification of sickness and absence, and the keeping of a registry are specified by the Agricultural Poisonous Substances Regulation 1975. The health and safety education of prospective agricultural workers is stressed. General information on symptoms of intoxication and treatment of poisoning for various pesticide groups is presented.

77-2329 Nishiuchi, Y. (Agric. Chem. Insp. Stn., Min. Agric. For., Kodaira, Tokyo, Japan) **[Effect of chemicals on aquatic animals.]** *Kagaku to Seibutsu (Chem. Living Things)* 15(7): 428-429; 1977. (Japanese)

The history of pesticide toxicity to non-target aquatic organisms is presented, beginning with the mass death of shellfishes in Ariake Bay in 1965. The strict limitation of use of polychlorocyclodienes in 1956 and of PCP in 1959, and the more stringent restriction of PCP, polychlorocyclodienes, benzoepin, and rotenone in 1971 were due to their toxicity to aquatic animals. Pesticides are currently classified into group A, B, C, or D according to their acute toxicity to young carp and water flea. The groups are defined as A: LC50 $>$ 10 ppm (carp 48 hr), $>$ 0.5 ppm (water flea, 3 hr); B: LC50 0.5-10 ppm (carp 48 hr) or LC50 $>$ 10 ppm (carp 48 hr) and LC50 $<$ 0.5 ppm (water flea, 3 hr); C: LC50 $<$ 0.5 ppm (carp, 48 hr), D: LC50 $<$ 0.1 ppm (carp 48 hr). The selection and adoption of aquatic animals as indicator organisms, chronic toxicity including physiological and morphological anomalies, the effects and fate of pesticides and evaluation of their metabolites are currently important problems.

77-2330 Nomura, S. (Fac. Med., Kumamoto Univ., Kumamoto, Japan) **[Basic studies on the evaluation of skin-irritating activity of agricultural pesticides.]** *Monbusho*

Itakukenkyu Hokoku (Rep. Res. Grants Min. Educ.), Igaku II (Med. II), Tokyo p. 9; 1974. (3 references) (Japanese)

Three procedures were used to establish a standard method for the evaluation of skin irritation by pesticides. The concentration of the pesticides to be used in the patch test was determined. An epidemiological study of dermal impairments was performed on experienced workers. Skin irritancy studies were performed on rats and rabbits treated with pesticides. The positive results of a 24 hr patch test were calculated. The percentages of positive results obtained for the various concentrations of the individual pesticides were: 5.3%, 15.8%, and 31.6% at maneb concentrations of 0.01%, 0.1%, and 0.5%; 5.0%, 5.9%, and 11.8% at thiophanate concentrations of 0.05%, 0.1%, and 0.5%; 5.6% and 11.1% at captafol concentrations of 0.05%, 0.5%. Chlorothalonil concentrations of 0.05%, 0.19%, and 0.5% produced positive results from more than 80% of the test subjects. Approximately 7.1% of the human population tested had a positive reaction to a 1.0% formaldehyde solution. The appropriate concentrations of the pesticides for the patch test were calculated as 0.01% maneb, 0.1% captafol, and 0.05% chlorothalonil. Skin irritations afflicted 58.1% of the 160 orchard workers.

77-2331 Bakhadyrov, M. A. ; Zhuravleva, R. A.; Latypova, R. I. (Dep. Ind. Hyg. Biol., Tashkent Med. Inst., Tashkent, USSR) **Gigienicheskie usloviia truda pri posledovatel'nom primenenii kotorani i antio i ikh vliianie na organizm rabotaiushchikh. [Working conditions during the consecutive use of Kotoran and anthio and their effects on workers.]** *Med. Zh. Uzb.* 1: 64-67; 1977. (Russian)

The health status of farm equipment operators dusting cottonfields with kotoran (fluometuron) and anthio (formothion) consecutively was studied. The overall exposure to kotoran (0.76-8 mg/m^3 in the air) lasted 25-30 days, followed by exposure to formothion (0.707-1.422 mg/m^3 in the air) for 2-3 months with an exposure-free interval of 1-1.5 months. The workers were in good health before the field work. Exposure to kotoran caused slight tachycardia (pulse 94-102/min), moderate arterial hypertension (130/95-145/105 mm Hg), hyperhydrosis in 38%, tremor of the hands in 27.3%, and dermographia in 47.6%. Reductions in erythrocyte count, SH group level, and peroxidase and cytochrome oxidase activities were observed. Most of the changes disappeared 3 weeks after exposure. The hematological and enzymatic changes occurring during the second exposure (to formothion) were more pronounced in those workers who had also been exposed to kotoran. The normalization of the biochemical parameters was also slower in the latter group. The findings suggest the necessity of establishing exposure-free periods between exposures to different pesticides.

77-2332 Anonymous. **2,4,5,-T and spina bifida.** *N. Z. Med. J.* 588(85): 436; 1977.

In New Zealand, public interest in a possible association between spina bifida and 2,4,5-T exposure has recently been aroused. The alleged dangers of 2,4,5-T were investigated in 1972. Since that time there has been no new evidence to support the demands for the prohibition of 2,4,5-T use.

77-2333 Sare, W. M. ; Forbes, P. I. (Te Awamutu, New Zealand) **The herbicide 2,4,5-T and its possible dysmorphogenic effects.** *N. Z. Med. J.* 588(85): 439; 1977. (2 references)

The herbicide 2,4,5-T and its contaminant dioxin are suspected to cause neural tube defects. To determine whether or not it is the causative agent in human fetal deformities, it is essential that conception dates be accurately known and contact with the herbicide be positively ascertained. A thorough interrogation must be performed. If humans are as sensitive to 2,4,5-T as animals, then approximately 8 g will produce teratogenic effects. However, there is the possibility that humans are more sensitive to dioxin than test animals. Reports of deformities in newborn animals are also being recorded.

77-2334 Pinkham, C. F. A. ; Pearson, J. G.; Fuller, J. J.; Bender, E. S. (Edgewood Arsenal, Aberdeen Proving Ground, MD) **Preliminary environmental survey, Pine Bluff Arsenal, Pine Bluff, Arkansas, December 1972.** *Natl. Tech. Inform. Serv.* AD-A007,798, 57 p.; 1975.

The information compiled in the report was used to design and interpret results from an ecological survey initiated at Pine Bluff Arsenal, Pine Bluff, AR. The program was initiated in November 1972 to biologically assess the effects of installation operation at Pine Bluff Arsenal. The report contains background information on the nature of Pine Bluff Arsenal and the surrounding county, their natural resources, and actual or potential environmental impact on these resources from operations at Pine Bluff Arsenal.

77-2335 Shih, C. C. ; Tobias, R. F.; Clausen, J. F.; Johnson, R. J. (TRW Systems Group, Redondo Beach, CA) **Thermal degradation of military standard pesticide formulations.** *Natl. Tech. Inform. Serv.* AD-A008,023, 279 p.; 1975.

The study was aimed at providing key experimental data for the design of a prototype pesticide incineration system. A total of 14 chlorinated hydrocarbon military standard pesticide formulations have been investigated in the laboratory-scale incinerator, and it has been demonstrated that incineration is an extremely efficient process for the safe disposal of these pesticide formulations. Based on the experimental data, a minimum residence time of 0.4 second at temperatures above 1845F and excess air in the range of 45 to 60 percent is recommended as the operating region for pesticide incineration. In addition, supplementary experiments indicated that pesticide incineration has little or no effect on the combustion chamber refractory liners, and that no significant agglomeration or breakdown of the dust particles would take place in the incineration of the dust formulations. Analytical procedures and thermochemistry and kinetics are discussed.

77-2336 Ferguson, T. L. (Natl. Agric. Chem. Assoc., Washington, DC) **Pollution control technology for pesticide formulators and packagers.** *Natl. Tech. Inform. Serv.* PB-241,001, 154 p.; 1975.

The overall objectives of this study were to identify

the best wastewater treatment technologies applicable to pesticide formulation plants, and to provide the pesticide formulation industry with a source of practical information on how to comply with effluent limitations. Specific objectives were: Characterization of the industry; characterization of the wastewater produced; assessment of applicable treatment technology; identification and assessment of best practicable, best available, and pretreatment technologies; and identification of research and development needs. A dual approach was used to obtain the information needed to meet these objectives. The formulation industry was surveyed to characterize its operation and identify plants already using good waste treatment practices. As an additional part of this study, data were compiled that had been generated to update the Grady Disposal Manual, and integrated into the format of the original document. The updated manual has been included.

77-2337 Combustion Power Co. Inc. (Menlo Park, CA) **LSW-500 disposal of Air Force liquid wastes.** *Natl. Tech. Inform. Serv.* AD-A010,429, 143 p.; 1975.

Presented are the results of a feasibility investigation on thermal degradation of selected USAF liquid wastes in a fluidized bed incineration system. Aircraft washrack wastes, paint stripping wastes, herbicide Orange, petroleum, oil and lubricant wastes (POL), municipal garbage and sewage sludge were used for testing in Combustion Power Company's 3-foot diameter (LSW-500) fluid bed combustor. Results show that with proper liquid waste injection locations and procedures POL wastes or shredded and air classified municipal garbage can be used as fuel to dispose of non-fuel liquid wastes without requiring supplemental fuel. When using solid waste as fuel to dispose of liquid waste or when using limestone to control HCl an additional particulate emission control device downstream of the first and second stage inertial system will be required. Combustion Power Company is presently developing a dry scrubber for this purpose.

77-2338 Komiya, K. (Kanagawa Prefectural Med. Center for Children, Yokahama, Kanagawa, Japan) **[Vomiting in cases of non-digestive diseases. Part 6. Vomiting due to intoxication.]** *Shoni Naika (Internal Med. for Infants)* 9(7): 1107-1108; 1977. (3 references) (Japanese)

Insecticides, rodenticides and fumigants are agricultural pesticide types responsible for some cases of exposure and intoxication. The symptoms of intoxication by ingestion are nausea and vomiting. Vomiting can be considered a defense reaction to accelerate the evacuation of the toxic substance. The vomiting reflex is centered in the medulla and activated by an irritation of the upper gastrointestinal tract. If the vomiting reflex is inhibited, an emetic may be administered. The theory of treatment is to prevent absorption and accelerate expulsion of the toxicant. Gastric lavage and the administration of an antidote are advised.

77-2339 Jpn. Assoc. Rural Med. **[On the "Survey of clinical cases of intoxication due to pesticides".]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(2):; 1977. (Japanese)

A long term study was sponsored by the Ministry of Health and Welfare for a seven year period (1970-1976) and will be continued through 1977. The purpose of the survey is to collect data on those people treated at hospitals or health centers for poisoning due to agricultural pesticides. Pesticide intoxication data will include systemic symptoms of acute poisoning; dermal, ophthalmic, and laryngopharyngeal injuries; allergic reactions; and chronic intoxications. Cases of suicidal and accidental exposure to pesticides will also be reported.

77-2340 Tanaka, H. (Kawakami Veg. Fruit Growers' Cooperative, Kawakami, Ehime, Japan) **[Results of investigation on body impairments due to pesticides for agriculture in Kawakami Area.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(2): 170; 1977. (Japanese)

Health examinations were performed in 1971 and 1973 in the village of Kawakami Shikoku Prefecture. The village produces 7000 tons of citrus fruit from 200 ha of orchards. In the first examination 27 of the 119 applicators exhibited some impairment due to zineb, maneb, mancozeb, amobam and mecarbam. Their symptoms consisted of contact dermatitis, malaise, loss of appetite, headache, and nausea. On the average it took 4.3 days to recover from these symptoms. Only 15 persons were treated by a physician. These findings indicate that the growers place their work ahead of their health.

77-2341 Nakajima, H. ; Kawabata, M. (Dept. Internal Med., Yamaguchi First Hospital, Yamaguchi, Japan) **[Health examination results from a model rural village in Yamaguchi Prefecture.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(2): 177; 1977. (Japanese)

The results are reported of health examinations on agricultural workers in 1976. These workers were employed on rice, cabbage, citrus and tobacco farms. The examinations were performed in January (leisure season) with 13 male and 28 female subjects and again in September (work season) with 22 males and 25 females. The detected abnormalities were: anemia (19%), reduction of cholinesterase (17%), hyperlipemia (14%), and hypertension (10%). A slightly higher GOT and alkaline phosphatase was found in some of the subjects. A reduced cholinesterase level was detected in six subjects during the leisure season and nine subjects during the busy season. Three subjects had reduced cholinesterase levels during both seasons. There was some correlation between reduced cholinesterase activity and the crop treated, hours of labor, and the frequency of pesticide application.

77-2342 Ito, I. (Jpn. Soc. Phytopathol., Tokyo, Japan) **[Proceedings of the discussion on the proposed law, "Special measures for controlling pine sawyer" at the Committee in the House. Part 4.]** *Noyaku Bijinesu (Pestic. Business)* 289: 2359-2362; 1977. (Japanese)

As recently as May 1977, there was an infestation of epidemic proportions in pine trees by the pine sawyer. It is not known whether the natural enemies (if any) of *Bursaphelenchus lignicolus* (a destructive nematode carried by the pine sawyer), and *Monochamus alternatus* are strong enough to prevent pine tree withering. Should a nematode resistant strain of pine tree be developed and propagated, it would be of no practical use for a number of years. The current control method for *M. alternatus* is the application of a 3% fenitrothion solution at 60 l/ha twice a year. Direct application of this pesticide also has a toxic effect on silkworms and bees. Although the effects of fenitrothion on *M. alternatus* have been studied, little information is available on its environmental effects. Opposition to the proposed control method is supported by: the lack of information on the effects of aerial application; the application season (May - June), so the pesticide will also affect non-target organisms; the large size of the application area; and the effect of fenitrothion on young water fowl.

77-2343 Ishihara, M. (Ehime Univ., Matsuyama, Ehime, Japan) **[Proceedings of the discussion on the proposed law, "Special measures for controlling pine sawyers" at the Committee in the House. Part 5.]** *Noyaku Bijinesu (Pestic. Business)* 291: 2377-2380; 1977. (Japanese)

Large scale forestry cutting and pesticide application in field paddies may have caused the abnormal proliferation of *Monochamus alternatus* in Japan. The adverse effects of fenitrothion on non-target organisms are presented. The systemic application of a nematocide to pine trees or soil is a possible alternative to aerial application of pesticides. Should aerial application of fenitrothion be the selected control for *M. alternatus*, then the protection of agriculture, fishery, wildlife, and livestock must be insured. There should also be some compensation for any damages incurred.

77-2344 Anonymous **[Proceedings of the discussion on the proposed law, "Special measures for controlling pine sawyer" at the Committee in the House. Part 6.]** *Noyaku Bijinesu (Pestic. Business)* 292: 2385-2387; 1977. (Japanese)

The first recorded outbreak of Japanese pine sawyer occurred in 1931. There is presently no large scale production of resistant varieties of pine trees. The ant is a natural enemy of the pine sawyer. Its effectiveness as a control means is questionable because it eats only the pine sawyer eggs. Chemical control would involve three to four applications of fenitrothion. The long period of egg laying and the short duration of fenitrothion effectiveness accounts for the frequency of application. The necessity for field experimentation and national reforestation are emphasized.

77-2345 Anonymous **[Proceedings of the discussion on the proposed law, "Special measures for controlling pine sawyer" at the Committee in the House. Part 7.]** *Noyaku Bijinesu (Pestic. Business)* 293: 2392-2395; 1977. (Japanese)

The withering of pine trees in Japan may be due to *B. lignicolus* (a nematode transmitted by pine sawyer), air pollution, or indiscriminate deforestation. According to the four principles of Koch, *B. lignicolus* can be considered responsible for the withering. Trees weakened by air pollution are particularly susceptible to invasion by the pine sawyer. The aerial application of fenitrothion appears to be the most effective control for *B. lignicolus*. Due to its toxicity, fenitrothion will be applied twice. Less effective methods are cutting, peeling, and burning of withered trees.

77-2346 Anonymous **[Proceedings of the discussion on the proposed law, "Special measures for controlling pine sawyer" at the Committee in the House: Part 8.]** *Noyaku Bijinesu (Pestic. Business)* 294: 2399-2402; 1977. (Japanese)

A survey of the toxicity of fenitrothion for humans and other non-target organisms should be performed prior to large scale application of the pesticide in pine forests. Fenitrothion is currently used in agriculture. Its application in commercial forests is under consideration. An alternative method of control is the use of a systemic insecticide.

77-2347 Anonymous **[Proceedings of the discussion on the proposed law, "Special measures for controlling pine sawyer" at the Committee of the House: Part 9.]** *Noyaku Bijinesu (Pestic. Business)* 295: 2407-2410; 1977. (Japanese)

Pine trees grow in a rather impoverished soil that predominates in Japan. Pine wood is an important resource. These trees are now endangered by an infestation of *B. lignicolus*, transmitted by *M. alternatus*. The presently accepted control method is the aerial application of fenitrothion. A suggested alternative control method is the use of a systemic insecticide (not yet officially registered). This would be contained in a small capsule and inserted directly into the tree. This would control *B. lignicolus* and protect the environment. The use of systemic insecticides would protect bees and silkworms from exposure to toxic insecticides.

77-2348 Anonymous **[Proceedings of the discussion on the proposed law, "Special measures for controlling pine sawyer" at the Committee in the House. Part 10.]** *Noyaku Bijinesu (Pestic. Business)* 296: 2416-2418; 1977. (Japanese)

Fenitrothion, an organophosphorus insecticide, has been heavily applied in the apple orchards of Japan. The rate of application has been approximately five times per year for the past 15 years. Aerial application of fenitrothion in apple orchards is common because by nature an orchard is unstable and necessitates pesticide usage to secure the crop. Conversely, the forest is a naturally occurring ecosystem and the use of fenitrothion may prove toxic to non-target organisms and create an imbalance. Therefore, aerial application of fenitrothion would affect silkworms, bees and fish. A protective measure for the bees is to either cover the hives or remove them from the treatment area for the duration of the spraying.

77-2349 Anonymous **[Proceedings of the discussion on the proposed law, "Special measures for controlling pine sa-**

wyer" at the Committee in the House. Part 11.] *Noyaku Bijinesu (Pestic. Business)* 297: 2424-2426; 1977. (Japanese)

Control of the pine sawyer in Japan is of economic importance to the lumber industry. Although fenitrothion has been selected as a control method, its effect on the environment is questionable. Some officials believe that the successful use of fenitrothion in apple orchards (a controlled environment) sanctions its use in the forest, a natural ecosystem. Opponents to the use of fenitrothion in pine forests cited the reduced number of pollinating insects in the orchards after each pesticide application. Artificial pollination compensates for this toxic effect. Also, the aerial application of fenitrothion in the apple orchard is limited in scope. Before fenitrothion is used on a large scale to control *B. lignicolus* and *M. alternatus*, aerial field tests should be conducted to study its toxicity to non-target organisms.

77-2350 Tachibana, N. ; Seto, H.; Nakamura, Y. (Agric. For. Fish. Comm., Senate, Tokyo, Japan) **[Proceedings of the discussion on the proposed law for controlling Japanese pine sawyer, in the Senate (House of Councilors). Part 1.]** *Noyaku Bijinesu (Pestic. Business)* 298: 2431-2434; 1977. (Japanese)

Fenitrothion was successfully applied in Karatsu, Saga Prefecture for the control of pine sawyer. The number of withered trees counted per year declined during the five year spraying period as follows: 1917 (1972), 679 (1973), 197 (1974), 107 (1975), and 108 (1976). Bees and silkworms were protected from exposure to the pesticide. There was no reported damage to fish and wildlife. During the application period the windows of all houses, schools, hospitals, and hotels were closed. There were no reported toxic effects to humans. A witness in the discussion reported observing dead fish in streams draining fenitrothion-treated forests after a rain.

77-2351 Nakamura, Y. ; Jito, M. (Assoc. Natur. Protect., Kanagawa, Japan) **[Proceedings of the Senate discussion on the proposed law for controlling Japanese pine sawyer. Part 2.]** *Noyaku Bijinesu (Pestic. Business)* 299: 2439-2442; 1977. (Japanese)

In 1949, 286,000 m^3 of wood was damaged in Kagoshima Prefecture. This was due to an infestation by *Bursaphelenchus lignicolus*. To date, the traditional control method has been the cutting, barking and burning of infected trees. This is no longer possible due to the lack of manpower. In 1962 a small scale (500 ha) aerial application of fenitrothion was successful in reducing the damage rate to less than 1%. Mulberry trees and silkworms were protected. Experimental broad spectrum aerial application to 1857 ha, 4045 ha, 5809 ha, and 6959 ha was performed in 1973, 1974, 1975, 1976 respectively. Aerial application of fenitrothion is presently a consideration for the control of pine tree withering.

77-2352 Jito, M. ; Yoshioka, K. (Dept. Forestry, Kagoshima Prefectural Office, Kagoshima, Japan) **[Proceedings of the Senate discussion on the proposed law for controlling Japanese pine sawyer, Part 3.]** *Noyaku Bijinesu (Pestic. Business)* 300: 2447-2450; 1977. (Japanese)

Fenitrothion was successfully applied to 11,000 ha area of a 43,000 ha forest, without any reported damage to the ecosystem. Silkworms, crops, fish cultures and wildlife were not affected. The insect fauna is reported to have recovered rapidly after spraying ceased. According to a survey, pine tree withering begins from weakening by other environmental factors. This is confirmed by studying the annual rings.

77-2353 Yoshioka, K. (Dept. Forestry, Kagoshima Prefectural Office, Kagoshima, Japan) **[Proceedings of the Senate discussion on the proposed law for controlling Japanese pine sawyer. Part 4.]** *Noyaku Bijinesu (Pestic. Business)* 301: 2455-2548; 1977. (Japanese)

The nematode *Bursaphelenchus lignicolus* was found in some withered pine trees, but no relationship was found between its presence and the severity of damage. The nematode was not detected in several severely withered pine trees. It was suggested that the recent damage to pine trees is due to resin collection, forest clearing, exhaust fumes, natural air pollution by volcanic gases, cadmium in emissions from cement factories and flue gases from power stations. Reference is made to the insecticidal activity of fenitrothion, which kills mites. Mites are the natural enemies of *Monochamus alternatus* which precedes the infestation by *B. lignicolus*.

77-2354 Suzuki, S. ; Nakamura, Y.; Yoshioka, K. (Dept. Forestry, Kagoshima Prefectural Office, Kagoshima, Japan) **[Proceedings of the Senate discussion on the proposed law for controlling Japanese pine sawyer. Part 5.]** *Noyaku Bijinesu (Pestic. Business)* 302: 2463-2465; 1977. (Japanese)

Control of the pine sawyer by large scale application of fenitrothion is questionable because of the pesticide's tendency to eradicate all arthropods in the target area. This pesticide is used in orchards and decreases the population of pollinating insects. This necessitates artificial pollination.

77-2355 Yoshioka, K. ; Suzuki, S.; Terada, K. (Dept. Forestry, Kagoshima Prefectural Office, Kagoshima, Japan) **[Proceedings of the Senate discussion on the propsed law for controlling Japanese pine sawyer. Part 6.]** *Noyaku Bijinesu (Pestic. Business)* 303: 2472-2474; 1977. (Japanese)

The pine forest in Saga Prefecture, Japan, developed a withering disease which was attributed to general air pollution created by a change to petroleum fuel. A reduction of air pollution in this area then reduced the severity of the withering. This type of reasoning does not apply to a complicated ecological problem such as the infestation of forests with pine sawyer and *B. lignicolus*. The whole ecological system must be considered when deciding on a control method.

77-2356 Yoshioka, K. ; Kubo, W.; Seto, H.; Jito, M. (Dept. Forestry, Kagoshima Prefectural Office, Kagoshima, Japan) **[Proceedings of the Senate discussion on the propsed**

law for controlling the Japanese pine sawyer. Part 7.] *Noyaku Bijinesu (Pestic. Business)* 304: 2480-2482; 1977. (Japanese)

Air pollution is thought to accelerate pine tree withering due to the pine sawyer. Fenitrothion is the propsed control means for the sawyer (*M. alternatus*); however, the natural enemy of the sawyer must be protected. A survey by the Wild Bird Protection Society reported no damage to birds by fenitrothion. Proponents of fenitrothion aerial application recorded no trace of the pesticide in water quality examinations.

77-2357 Yoshioka, K. ; Harada, T.; Seto, H.; Jito, M. (Dep. Forestry, Kagoshima Prefectural Office, Kagoshima, Japan) **[Proceedings of the Senate discussion on the propsed law for control of Japanese pine sawyer. Part 8.]** *Noyaku Bijinesu (Pestic. Business)* 305: 2488-2490; 1977. (Japanese)

Bursaphelenchus lignicolus feeds on a fungus in pine trees. A weak fungicide injected into the pine trees will kill the fungus and indirectly kill the nematode. It would take a number of men to inject the fungicide into each tree. The continued aerial application of fenitrothion in the Kyushu pine forests is supported until other controls are found. Withering of pine woods continues in areas where no insecticide has been applied.

77-2358 Tsukada, D. ; Joto, M.; Seto, H.; Yoshioka, K.; Nakamura, Y.; Kiyamu, S. (Author address not given) **[Proceedings of the Senate discussion on the proposed law for controlling the Japanese pine sawyer. Part 9.]** *Noyaku Bijinesu (Pestic. Business)* (306): 2496-2498; 1977. (Japanese)

Pine tree withering in Kagoshima was controlled by fenitrothion. The results were rather favorable after a five year trial period. The frequency of application and toxicity to non-target organisms, especially fish, must be considered before large scale application. Fish tend to be affected by the pesticide after a rainfall.

77-2359 Schlatter, C. (Inst. Toxikol., Eidgenoess. Techn. Hochsch., Zurich, Switzerland) **[Toxicology of pesticides.]** *Schweiz. Rundsch. Med. (Praxis)* 66: 470-477; 1977. (German)

Some cases of pesticide intoxication and the detection of persistent organochlorine pesticide residues in many substrates have focused public attention on this problem. Knowledge and regulation of pesticide levels has become very extensive compared to knowledge concerning other foreign compounds in air, in the household, and in industry. The most important instrument for residue regulation is the tolerance value. Long-term effects must be included in establishing the tolerance. Alterations in organ function due to simultaneous intake of various pesticides have not been observed to date. Substances with demonstrated carcinogenic effects in test animals are generally not approved for use as pesticides, with the exception of certain organochlorine compounds, where the suitability of extrapolating results of animal experiments to humans is questionable. The mutagenesis problem is still being examined in relation to pesticide residues.

77-2360 Hayes, W. J., Jr. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN) **Mortality in 1973 and 1974 from pesticides.** *Toxicol. Appl. Pharmacol.* 41(1): 177-178; 1977.

Mortality in the United States associated with pesticides was studied for the years 1973 and 1974 to learn whether there had been any change as compared to years in which earlier studies were made. The work, which depended on cooperation of the National Center for Health Statistics and of all state departments of health, involved review of all death certificates in seven main categories in which deaths associated with pesticides sometimes are reported. There were 1591 such certificates in 1973 and 1561 in 1974. For each death in which a pesticide was even suspected, a letter was written to the signer of the certificate, to the hospital where death occurred, or to both. Most accidental deaths from pesticides were classified properly, but some still were reported in categories other than the one (E865) specifically established for this class of poisons. As in the past, most poisonings in 1973 and 1974 were nonoccupational and involved gross carelessness. However, the number of accidental deaths associated with pesticides was greatly reduced. In 1961 and earlier, there were over 100 such deaths per year in the United States, but the number reported was 56 in 1969, 32 in 1973, and 35 in 1974. (Author abstract by permission).

77-2361 Shtenberg, A. I. ; Torchinskii, A. M. (Inst. Nutr. USSR Acad. Med. Sci., Moscow, USSR) **Aktual'nye problemy gigieny pitaniia i pishchevoi toksikologii (Sovremennoe sostoianie i perspektivy). [Current problems in food hygiene and dietary toxicology (State of the art and perspectives).]** *Vestn. Akad. Med. Nauk SSSR* (2): 81-88; 1977. (47 references) (Russian)

Current problems of food hygiene are reviewed with special reference to pesticides. Studies on the hygienic aspects of pesticides residues in food should aim at the elaboration of a valid theory for predicting the pathological changes that may be caused by pesticide residues and of criteria for assessing their potential hazards. In this respect, pesticides should be studied in terms of their influences on morbidity due to other factors rather than in terms of direct toxicity. Pesticides may alter the concentrations of certain vitamins and minerals in vegetables and fruits.

See also 77-2280 77-2366 77-2396 77-2460

77-2362 Kvasnicka, P. ; Svobodova, Z. (Natl. Inst. Agric., Ceske Budejovice, Czechoslovakia) **Toxicita kombinovanych herebicidu s obsahem MCPA pro ryby. [Toxicity of MCPA-based herbicide combinations to fish.]** *Agrochemia (Bratislava)* 17(3): 65-69; 1977. (5 references) (Czech)

The acute toxicity of three combination herbicides, all containing MCPA, to fish was examined. Bandex, containing 35% MCPA and 3% dicamba, was moderately toxic with an LC50 of 0.45 cc/dm^3 for carp. Keropur contained 29% MCPA, 2.2% dicamba, and 3.4% benazolin, and was moderately toxic (LC50 0.36 cc/dm^3) to carp and rainbow trout and toxic to *Poecilia reticulata* (LC50 to 0.067 cc/dm^3). Dikogren, containing 28% MCPA, 4% simazine, and 18% terbutryn, was highly toxic to fish (LC50 for carp 42 mg/dm^3 , LC50 for rainbow trout 13.0 mg/dm^3, and LC50 for *Poecilia reticulata* 15 mg/dm^3). The clinical picture of intoxication by these pesticides in fish is primarily characterized by suppressed phases. No characteristic pathoanatomical intoxication pattern was seen.

77-2363 Rusek, J. (Inst. Entomol., Czech. Acad. Sci., Prague, Czechoslovakia) **Effect of dinoseb acetate on the soil mesofauna.** *Agrochemia (Bratislava)* 17(3): 79-81; 1977. (1 reference) (Czech)

Dinoseb acetate was applied in a dose of 5 dm^3/ha in experimental winter wheat fields near Prague and experimental alfalfa fields near Brno, Czechoslovakia. The herbicide had an insecticidal effect on the studied groups of soil mesofauna, causing a 35.4-71% reduction in Oribatei, a 31.9-33.5% reduction in other mites (Trombidiformes, Parasitiformes) and a 34.4-45.6% reduction in Collembola in the first few hours and days after application. Synecologic analysis of Collembola communities indicated that the herbicide's effect was different for individual species or ecological groups. It directly reduced the numbers of some atmobiotic and hemiedificator species and indirectly (via reduction of soil microflora) reduced the numbers of some euedificators. Application of the herbicide led to an increase in the numbers of some hemiedificators and euedificators as a result of reduction in predator species (Acarina). The effects of the herbicide continued to reduce the numbers of mites from groups other than Oribatei up to 14 days after application (69.1% reduction), while Oribatei numbers had slowly increased and Collembola numbers had sharply increased by this time. It would be incorrect to assume that the soil mesofauna was thus restored, however, since both quantitative and qualitative changes in mesofauna structure and the ecosystem occurred.

77-2364 Veverka, I. K. (Inst. Food Sci., VURV, Prague-Ruzyne, Czechoslovakia) **Side effects of fungicides.** *Agrochemia (Bratislava)* 17(3): 81-86; 1977. (91 references) (Czech)

Literature on some of the most significant secondary effects of fungicides is reviewed. Emphasis is on fungicides currently used. In addition to their direct toxic effects on fungi, fungicides may also stimulate fungal growth when applied in low doses, interfere with the relationship between fungi and hyphospheral bacteria, alter fungal morphology, appearance and physiology and increase fungal resistance. Fungicides have definite effects on plant growth, development and physiological processes. They may indirectly affect the incidence of fungal and other diseases by various ways: stimulating pathogens, decreasing or increasing host resistance, suppressing antagonists or vectors, affecting the rate of viral reproduction or selecting out resistant fungal strains and altering fungal pathogenecity. Cytogenetic effects of fungicides have been demonstrated in fungi, bacteria, plants and insects and other animals (unspecified).

77-2365 Kawauchi, T. ; Gada, T.; Yoshikawa, K.; Endo, H.; Sugiyama, T.; Yahagi, T.; Sasaki, M. (Natl. Cancer Cent., Tokyo, Japan) **[Development of screening technology on suspected carcinogenic substances mainly based on mutagenicity.]** *Annu. Rep. Cancer Res. 1976, Jpn. Minist. Health Welfare* 2: 744-755; 1977. (Japanese)

Thirty-five suspected carcinogenic substances including maneb, thiram, dichlorvos, trichlorfon, and chlorothalonil were assessed for mutagenicity by several methods. Maneb was found to be mutagenic only by the rec-assay method using *Bacillus subtilis*, with or without added rat liver S9 and by the chromosome test using Chinese hamster cell culture. Thiram was mutagenic by the rec-assay method using *B. subtilis*, by the reverse mutation method using *Salmonella typhimurium* TA100 and TA98 or TA1537 without S9, and by the chromosome breakage test using rat somatic cells. Dichlorvos was positive (sometimes weakly) in the rec-assay method using *B. subtilis* only with added S9, in the reverse mutation test using *S. typhimurium* TA100 and 98 or 1537 with S9, and in the chromosome breakage test using Chinese hamster cell culture. Trichlorfon was positive in the reverse mutation test using a *S. typhimurium* strain with S9 and the chromosome breakage test using rat somatic cells, although weakly. All compounds were assessed by all the available methods such as rec-assay, reverse mutation, and chromosome breakage (or chromosome aberration). Mutagenicity was not shown for chlorothalonil by these methods.

77-2366 Kimura, M.; Kameda, T.; Suzuki, Y.; Sugaya, T.; Kurokawa, S.; Hayashi, S. (Inst. Rural Med., Hiraga Gen. Hospital, Hiraga, Akita, Japan). **[Studies on skin patch tests for contact dermatitis by pesticides.]** *Akita-ken Noson Igaku Kenkyusho Nenpo (Annu. Rep. Akita Inst. Rural Med.)* 4: 77-80; 1974. (Japanese)

In March, 1975, 48 hr skin patch tests were performed on the backs of 39 women from Hiraga county in Akita Prefecture. This is an agricultural area with fruit orchards and rice paddies. The pesticides tested were: fenitrothion, diazinon, dithane, monox, paraquat dichloride, nitrofen, captafol, Blasticidin S, dichlorvos, phenthoate, chlorobenzilate, anilazine, chlorothalonil, maneb, trifluralin, benomyl, thiophanate, and *p*-nitrophenyl 2,4,6-trichlorophenyl ether (CNP). Dilutions of 1000, 100 and 10 fold of the formulation were applied. The pesticides giving the highest positive results

were chlorothalonil, captafol, nitrofen, thiophanate, and fenitrothion. Positive responses to the pesticides were displayed more frequently at lower concentrations. Some pesticides irritated the skin at concentrations applied in the field.

77-2367 Weeks, M. H. ; Lawson, M. A.; Pennington, N. E.; Angerhofer, C. D.; Davenport, C. D. (U. S. Army Environ. Hyg. Agency, Aberdeen Proving Ground, MD 21010) **Preliminary assessment of the acute toxicity of malathion in animals.** *Arch. Environ. Contam. Toxicol.* 6(1): 23-31; 1977. (8 references)

Laboratory studies were conducted to acquire information concerning the acute toxicity of malathion in animals under various conditions of exposure. The responses in rabbits and quail exposed to aerosols generated from technical grade malathion (95%) and approximating an ultra-low volume ground spray were compared with those from a 6% malathion/No. 2 fuel oil mixture simulating a high volume spray. Results indicate that technical grade malathion (95%) as an ultra-low volume spray and at effective insecticidal concentrations in particle sizes having a mass median diameter of about 12 μ is relatively nonhazardous compared to the possible toxic fuel oil effects of a 6% malathion/No. 2 fuel oil mixture with a mass median diameter of 25 μ. Based on blood plasma cholinesterase activity analyses, quail were more sensitive to equivalent malathion exposure concentrations than were rabbits. Oral administration of technical grade malathion to rabbits resulted in reduction of plasma and erythrocyte cholinesterase activity at dosages of 120, 300, and 600 mg/kg, with death resulting from 1200 mg/kg. (Author abstract by permission)

77-2368 Courtenay, K. D. (Health Effects Res. Lab., Exp. Biol. Div., Environ. Prot. Agency, Research Triangle Park, NC 27711) **Prenatal effects of herbicides: evaluation by the prenatal development index.** *Arch. Environ. Contam. Toxicol.* 6(1): 33-46; 1977. (18 references)

The herbicides 2,4-D and 2,4,5-T and many of the esters of these compounds produced cleft palates in CD-1 mice. Silvex and Agent Orange also produced cleft palates. Depending on the dose and means of administration variable responses relating to the production of cleft palates, effect on fetal weight, and effect on fetal mortality were obtained. In order to view these data comprehensibly, the Prenatal Development Index was determined. This index was computed from the incidence of malformed fetuses, fetal mortality and fetal body weight. This made it possible to evaluate data from some experiments with fetotoxic doses of compounds in which the high incidence of fetal mortality and consequently low incidence of viable fetuses obscured the response. (Author abstract by permission)

77-2369 Rodriguez, L. D. ; Dorough, H. W. (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506) **Degradation of carbaryl by soil microorganisms.** *Arch. Environ. Contam. Toxicol.* 6(1): 47-56; 1977. (19 references)

Four days after carbaryl-naphthyl-l-^{14}C was mixed with soil from a field treatd 6 months previously with 4 lb/A of the same insecticide, only 28% of the radiocarbon remained. Approximately 90% remained in soils with no history of pesticide applications. However, dissipation of the carbaryl-^{14}C residues from the latter soils continued at a rather steady rate over a 120-day test period, whereas there was little dissipation after 4 days from the former. Consequently, the total ^{14}C-residue levels were about the same, 15 to 20% of applied, when the last samples were taken. Carbaryl, per se, was the only apolar ^{14}C-residue recovered from the soil and only small quantities, less than 2% of the amount applied, of extractable polar metabolites were encountered. Almost all of the terminal residues were unextractable from the soil with mixtures of acetone and water. Much of the loss of ^{14}C-residues from the soil was attributed to the liberation of ^{14}C-carbon dioxide as a result of microbial degradation of the naphthalene ring. Several fungal and bacterial isolates degraded carbaryl in the same manner as observed with soil incubations, but the rates of degradation were much slower. (Author abstract by permission)

77-2370 Rao, G. S. ; Dhasmana, A.; Zaidi, S. H.; Kaw, J. L.; Pandya, K. P. (Ind. Toxicol. Res. Cent., Lucknow, India) **Toxicological studies on hydrocarbons—Iomex.** *Arch. Environ. Contam. Toxicol.* 6(1): 57-62; 1977. (20 references)

Hematological changes and concurrent enzymatic activities in various tissues were determined in rats injected parenterally with Iomex, a petroleum derivative and proposed weedicide. Among the hematological parameters studied only the differential leucocytic count showed significant alterations. This was indicated by a significant decrease in the number of lymphocytes and an increase in those of neutrophils. Significant differences were not observed in the levels of acid phosphatase, glutamic oxaloacetic, and glutamic pyruvate transaminase activities in brain and liver of the experimental group of animals. (Author abstract by permission)

77-2371 Ottoboni, A. ; Bissell, G. D.; Hexter, A. C. (Calif. Dep. Health, 2151 Berkeley Way, Berkeley, CA 94720) **Effects of DDT on reproduction in multiple generations of beagle dogs.** *Arch. Environ. Contam. Toxicol.* 6(1): 83-101; 1977. (37 references)

The effects of chronic oral exposure to 1, 5 and 10 mg of technical DDT/kg/day on: 1) age at puberty, length of gestation, fertility, success of pregnancy, litter size, and lactational ability of dams; 2) viability, survival to weaning, sex distribution and growth of pups; and 3) morbidity, mortality, organ/body weight ratios, gross and histologic abnormalities in all animals were studied through three generations of Beagle dogs. There were a total of 135 adult female and 63 adult male dogs in the project which produced 650 pups. There were no statistically significant differences among control and DDT-treated dogs in any of the reproductive variables, with the exception of age at puberty of the females. DDT-treated females had their first estrous cycles 2 to 3 months

earlier ($P < .001$) than the control dogs. Selected DDT-treated females, held for a second breeding period, had normal anestrous periods between their first and second estrous cycles. There was no effect of DDT on survival, growth, and sex distribution of pups, nor was there any influence on morbidity, mortality, gross or histologic findings in any of the dogs. All organ/body weight ratios were normal, with the possible exception of an increase in liver/body weight ratio in some DDT-treated animals. (Author abstract by permission)

77-2372 Morgan, D. P. ; Hetzler, H. L.; Slach, E. F.; Lin, L. I. (Dep. Prev. Med. Environ. Health, Univ. Iowa College of Med., Iowa City, IA 52240) **Urinary excretion of paranitrophenol and alkyl phosphates following ingestion of methyl or ethyl parathion by human subjects.** *Arch. Environ. Contam. Toxicol.* 6(2/3): 159-173; 1977. (14 references)

Nitrophenolic and alkyl phosphate metabolites of methyl and ethyl parathion appear in the urine of human subjects soon after doses of 1 to 4 mg have been ingested. Particular alkyl phosphates can serve as specific indices of absorption of the respective parathions. Paranitrophenol and diethyl thiophosphate are rapidly eliminated in the urine, while excretions of dimethyl phosphate, and particularly diethyl phosphate, are more protracted. Cumulative excretions of paranitrophenol and alkyl phosphates exhibit sufficient dose-dependence at convenient intervals following parathion ingestion to encourage use of metabolite measurements in estimating occupational absorption of the parathion insecticides. (Author abstract by permission)

77-2373 Rumsey, T. S. ; Miller, W. R.; Dinius, D. A. (U. S. Dep. Agric., Beltsville, MD 20705) **Residue content of beef feedlot manure after feeding diethylstilbestrol, chlortetracycline and Ronnel and the use of stirofos to reduce population of fly larvae in feedlot manure.** *Arch. Environ. Contam. Toxicol.* 6(2/3): 203-212; 1977. (22 references)

Two beef cattle feedlot experiments were conducted to determine the amount of certain agricultural chemicals that are likely to be found in both fresh and stored feedlot manure and to investigate fly control in this manure. In experiment 1, diethylstilbestrol (DES), chlortetracycline (CTC), and ronnel were used as feed additives. Fresh manure, stored manure, runoff water, manure weathered on pasture, and soil from pasture fertilized with manure were analyzed for these additives. Stirofos (tetrachlorvinphos) was added to fresh manure as a larvicide for fly control. In experiment 2, the residue aspects of DES and CTC were repeated. In this experiment, stirofos instead of ronnel was fed with DES and CTC. Sixty-eight percent of the DES fed to cattle appeared in fresh manure and 52% in manure stored for 12 weeks. Comparable percentage values were 17 and 11% for CTC and 13 and 3% for ronnel; somewhat less DES and CTC were found when a concentrate diet was fed. Detectable amounts of DES, CTC, and ronnel were not found in runoff water, weathered manure, or soil. Adding an emulsifiable concentrate formulation of stirofos directly to manure at a rate of approximately 45 ppm of wet manure completely controlled the larvae of house fly (*Musca domestica* L.) whereas feeding stirofos at a rate of 1.5 mg per kg of body weight daily reduced larval counts 82% in manure from forage-fed heifers and 63% in manure from concentrate-fed heifers. Stirofos was not detected in runoff water, weathered waste, or soil. (Author abstract by permission)

77-2374 Fergin, T. J. ; Schafer, E. C. (U. S. Fish Wildl. Serv., Denver Wildl. Res. Cent., Bldg. 16, Fed. Cent., Denver, CO 80225) **Toxicity of dieldrin to bobwhite quail in relation to sex and reproductive status.** *Arch. Environ. Contam. Toxicol.* 6(2/3): 213-219; 1977. (10 references)

In a study of dieldrin toxicity to breeding and nonbreeding bobwhite quail (*Colinus virginianus*), breeding birds of both sexes on long photoperiods were more susceptible to dieldrin poisoning than nonbreeding birds, although some differences were not statistically significant at the .10 level. Shortened photoperiods caused gonadal regression, weight loss, and additional mortalities among dieldrin-treated birds previously in breeding condition. Dieldrin did not influence food consumption, body weight, or egg production until about a week or less before death of individual birds. Dieldrin brain residues were higher among birds that died during the study than among survivors sacrificed at its termination. Among those that died, neither dieldrin treatment level, reproductive status, nor sex seemed related to brain residue levels. Nevertheless, within those factors, levels were slightly higher in the birds that died later in the test. (Author abstract by permission)

77-2375 Watanabe, P. G. ; Sharma, R. P. (Toxicol. Curriculum, Dep. Vet. Sci., Utah State University, Logan, UT 84322) **Tri-*o*-tolyl phosphate neurotoxicity: lack of evidence for autoimmunologic involvement.** *Arch. Environ. Contam. Toxicol.* 6(2/3): 233-240; 1977. (22 references)

Studies on the involvement of autoimmunity in the pathogenesis of tri-*o*-tolyl phosphate ((TOTP, TOCP) induced neurotoxicity in chickens were conducted. Immunosuppressive therapy including γ-radiation and drug treatments was utilized to determine its effects on the neurotoxic syndrome. Whole-body γ-irradiation up to 1020 roentgens failed to show any consistent protection from the TOTP induced paralysis. Therapy involving prednisone alone or in combination with 6-mercaptopurine and antilymphocyte serum likewise indicated no protection. Stimulation of humoral and cellular immunity by TOTP was investigated. Complement fixation, precipitation tests, splenic migration inhibition, and skin tests did not indicate stimulation of autoimmunity toward nervous tissue or liver. The present investigation was unable to demonstrate primary involvement of an autoimmune nature in the neurotoxicity produced by TOTP in the chicken. (Author abstract by permission)

77-2376 Schafer, E. W., Jr. ; Brunton, R. B.; Cunningham, D. J.; Lockyer, N. F. (U. S. Fish Wildl. Serv., Denver

Wildl. Res. Cent., Lakewood, CO 80225) **The chronic toxicity of 3-chloro-4-methylbenzamine HCl to birds.** *Arch. Environ. Contam. Toxicol.* 6(2/3): 241-248; 1977. (20 references)

3-Chloro-4-methyl benzamine HCl (DRC-1339, 3-chloro -*p*- toluidine), an avian toxicant, was fed to five species of birds for periods up to 120 days. The 30-day LC50 of uniformly treated feed for starlings was 4.7 ppm and the 90-day LC50 was 1.0 ppm. The 28-day LC50 for coturnix was 18 ppm. The 30-day LC50 for pigeons was less than 100 ppm. Pheasants fed diets containing 2% DRC-1339 baits diluted to a rate of 286 ppm of DRC-1339 died within 22 days. Bobwhite quail fed similar diets suffered some mortality at levels as low as 2.9 ppm, but most survived 10 times this dosage level for the 120-day test period. Application of the Kenaga "Index of Chronicity" resulted in the conclusion that DRC-1339 was cumulatively toxic to birds. Reproduction in coturnix was adversely affected by treatments at 10 ppm of DRC-1339 and above. Reproduction in pigeons was adversely affected by a treatment of 25 ppm. In coturnix, DRC-1339 caused an increased incidence of egg breakage and decreased both egg and live chick production. In pigeons, DRC-1339 caused an increase in the proportion of infertile eggs. Reproductive ability of first generation offspring was not affected when parent coturnix and pigeons were fed DRC-1339. These data emphasize the need for care in the use of DRC-1339. The bait should be used only as registered and care exercised in storage and disposal of unused baits to avoid poisoning of nontarget species. (Author abstract by permission)

77-2377 Longcore, J. R.. ; Stendell, R. C. (U. S. Fish Wildl. Serv., Patuxent Cent., Laurel, MD 20811) **Shell thinning and reproduction impairment in black ducks after cessation of DDE dosage.** *Arch. Environ. Contam. Toxicol.* 6(2/3): 293-304; 1977. (27 references)

Captive black ducks (*Anas rubripes*) were fed dietary DDE [1,1-dichloro -2,2- bis (*p*-chlorophenyl) ethylene] at 10 ppm (dry weight; about 2 ppm on a natural diet basis) for 2 breeding seasons, then untreated feed for 2 succeeding years. Residues of DDE in the carcasses of adults declined 90% during the 2-year clean-up period. Following 2 years of dietary DDE, mean residues in eggs reached 64.9 ppm. Even after 2 years on clean feed, DDE residues in the eggs averaged 6.2 ppm or 9.5% of the mean DDE level reached after 2 years on treated feed. Shells of eggs from treated hens were about 20% thinner than shells of eggs from controls. Stoppage of DDE dosage resulted in progressively thicker shells, yet even after 2 years on untreated feed hens laid eggs with shells about 10% thinner than control hens. After DDE was removed from the diet, DDE residues in the eggs decreased, shell thickness increased, and reproductive success improved. Hens previously exposed to DDE, but then fed clean feed to 2 years, still produced significantly fewer surviving ducklings than did control hens. (Author abstract by permission)

77-2378 Yang, C. F. ; Sun, Y. P. (Dep. Plant Pathol. Entomol., Natl. Taiwan Univ., Taipei, Republic of China) **Partition distribution of insecticides as a critical factor affecting their rates of absorption from water and relative toxicities to fish.** *Arch. Environ. Contam. Toxicol.* 6(2/3): 325-335; 1977. (14 references)

Loaches, *Misgurnus anguillicaudatus* (Cantor), a common fish in Taiwan, were treated with DDT, dieldrin, and monocrotophos by continuous exposure in aqueous solutions (or suspensions) and by injection. DDT and dieldrin were 150 and 220 times more toxic, respectively, than monocrotophos, to the fish exposed in aqueous solutions (24-hr LC50), but only 1/9 and 1/4 as toxic as monocrotophos by injection (24-hr LD50). Results of GLC analyses indicate that, at the end of 24-hr exposure, 96.5% of DDT, 92.7% of dieldrin, and 14.3% of monocrotophos were absorbed by loaches from aqueous solutions. The initial rates of absorption for DDT and dieldrin were about 10 to 20 times faster than that for monocrotophos. The large differences in relative toxicity may be due to partition distribution which in turn caused differences in absorption, as DDT and dieldrin are lipophilic and monocrotophos is hydrophilic. Statistical analysis of the relationship between fish toxicities and partition coefficients supports the present finding. The coefficient of correlation is 0.70 between partition coefficients (benzene/water) and toxicities to fish (rainbow trout) of 12 organophosphorus insecticides, 0.74 between coefficients and corrected fish toxicities, and 0.96 between partition coefficients and corrected fish toxicities for organophosphates only. Results of analyses are significant at $< 1\%$ probability level. Similar correlation was also obtained between partition coefficients for hexane/water and toxicities of 8 organophosphorus and 5 organochlorine insecticides to rainbow trout. (Author abstract by permission)

77-2379 Schimmel, S. C. ; Patrick, J. M. (U. S. Environ. Protect. Agency, Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561) **Toxicity and bioconcentration of BHC and lindane in selected estuarine animals.** *Arch. Environ. Contam. Toxicol.* 6(2/3): 355-363; 1977. (22 references)

Flow-through, 96-hr bioassays were conducted to determine the acute toxicity of technical BHC and lindane to several estuarine animals. Test animals and their respective 96-hr lindane LC50 values were: mysid (*Mysidopsis bahia*), 6.3 μg/L; pink shrimp (*Penaeus duorarum*), 0.17 μg/l; grass shrimp (*Palaemonetes pugio*), 4.4 μg/L; sheepshead minnow (*Cyprinodon variegatus*), 104 microg/L; and pinfish (*Lagodon rhomboides*), 30.6 μg/L. The 96-hr LC50 values for pink shrimp and pinfish exposed to BHC were 0.34 and 86.4 μg/L, respectively. Two BHC bioconcentration studies were conducted with the osyter, *Crassostrea virginica* and pinfish. After 28 days exposure, oysters bioconcentrated an average of 218 X the BHC measured in exposure water, while pinfish bioconcentrated 130 X in their edible tissues and 617 X in offal. After one week in BHC-free sea water, no detectable residues were measured in oysters or pinfish. (Author abstract by permission)

77-2380 Galimberti, E. ; Gomarasca, P.; Sperandeo, F. (Sez. Ric. LPB Ist. Farm., Sp. A., Milan, Italy) **[Prevention**

of experimental neuritis induced by nitrofurantoin or triorthocresylphosphate.] *Boll. Chim. Farm.* 116(2): 98-106; 1977. (13 references) (Italian)

Previous findings of the anti-inflammatory effectiveness of an adrenal cortex hydrolysate in spinal arthroses suggested that additional studies should be conducted on its antineuritic effect. Neural function was examined in a screen-grasping test according to Zetler. Adrenal cortex hydrolysate alone decreased the clinging time; TOCP and nitrofurantoin each produced significant decreases in the grasping time; and simultaneous administration of adrenal cortex hydrolysate and either of the test compounds resulted in a less extensive shortening of the grasping time than administration of the test compounds alone. Both nitrofurantoin and TOCP produced histologically detectable polyneuritic changes: the smooth, continuous lines of the intact neural fibers were broken and irregularly curved following administration of these substances. These changes were attenuated or eliminated by simultaneous administration of the adrenal cortex hydrolysate.

77-2381 Popov, T. A. ; Zadorozhmaya, T. D. (All-Union Res. Inst. Hyg. Toxicol. Pestic., Polym., Plast., Kiev, USSR) **Ritmichnost' strukturno-funktsionalinykh izmenenii gepatotsitov pri vozdeistvii pestitsidov.[Rhythm of structural and functional changes in the hepatocytes following pesticide exposure.]** *Byull. Eksp. Biol. Med.* 83(3): 273-275; 1977. (Russian)

To investigate dursban (chlorpyrifos) metabolism in rat liver, experiments were performed in which dursban was perfused for 4, 8, and 15 days through rat livers exposed to the microsomal enzyme inhibitor CCl_4 or the microsomal enzyme inducer milbex. Examination of the hepatocytes revealed three stages of structural and functional changes. Beginning on the eighth day of perfusion, dealkylation processes in the hepatocytes were intensified, resulting in the production of less toxic metabolites from chlorpyrifos than the metabolites produced via the previous metabolic pathway.

77-2382 Goldstein, J. A. ; Friesen, M.; Hass, J. R.; Linder, R. E.; Bergman, H.; Hickman, P. (EPA, Environ. Res. Cent., Research Triangle Park, NC 27711) **Effects of pentachlorophenol on hepatic drug-metabolizing enzymes and porphyria related to contamination with chlorinated dibenzo-*p*-dioxins and dibenzofurans.** *Biochem. Pharmacol.* 26(17): 1549-1557; 1977. (49 references)

The hepatic effects of technical and pure grade pentachlorophenol were investigated in female rats fed 20, 100 and 500 ppm of each for 8 months. Technical pentachlorophenol was contaminated with 8 ppm hexa-, 520 ppm hepta-, and 1380 ppm octachlorodibenzodioxins and with 4 ppm tetra-, 42 ppm penta-, 90 ppm hexa-, 1500 ppm hepta- and 200 ppm octachlorodibenzofurans; pure pentachlorophenol contained less than 0.1 ppm of each of these contaminants. Technical pentachlorophenol produced hepatic porphyria and increased hepatic aryl hydrocarbon hydroxylase activity, glucuronyl transferase activity, liver weight, cytochrome-P-450, and microsomal heme, but not *N*-demethylase activity. The peak of the CO-difference spectrum of cytochrome P-450 was shifted to 448 nm, and there was a dramatic increase in the 455-430 ratios of the ethyl isocyanide difference spectrum. The enzyme changes were observed at 20 ppm of technical pentachlorophenol. Porphyria occurred at 100 and 500 ppm. Pure pentachlorophenol had no significant effect on aryl hydrocarbon hydroxylase activity, liver weight, cytochrome P-450, microsomal heme, the ethyl isocyanide difference spectrum or N-demethylase activity at any dose level, but did increase glucuronyl transferase at 500 ppm. In contrast, both pure and technical pentachlorophenol decreased body weight gain comparably at 500 ppm. It is concluded that technical pentachlorophenol produces a number of liver changes which cannot be attributed to pentachlorophenol itself, but are consistent with the effects of biologically active chlorinated dibenzo-p-dioxins and dibenzofurans. (Author abstract by permission)

77-2383 Hovanec, J. W. ; Broomfield, C. A.; Lieske, C. N.; Steinberg, G. M.; Lanks, K. W.. (Biomed. Lab., Edgewood Arsenal, APG, MD 21020) **Spontaneous reactivation of acetylcholinesterase following organophosphate inhibition. I. An analysis of anomalous reactivation kinetics.** *Biochim. Biophys. Acta.* 483(2): 312-319; 1977. (27 references)

The first kinetic studies on the spontaneous reactivation of Sarin-inhibited acetylcholinesterase (acetylcholine hydrolase, EC 3.1.1.7) are reported. With increasing pH the extent of reactivation increases while the observed rate constant decreases. An analysis of the change in aging rate constant as a function of pH suggests that the aging of alkylalkoxy phosphonylated acetylcholinesterases is not solely acid catalyzed. (Author abstract by permission)

77-2384 Lanks, K. W. ; Lieske, C. N.; Papirmeister, B. (Dep. Pathol., State Univ. NY, Downstate Med. Cent., Brooklyn, NY 11203) **Spontaneous reactivation of acetylcholinesterase following organophosphate inhibition. II. Characterization of the reactivating components.** *Biochim. Biophys. Acta.* 483(2): 320-330; 1977. (23 references)

Repeated cycles of inhibition by a variety of organophosphates followed by spontaneous reaction reveal a component of electric eel acetylcholinesterase (acetylcholine hydrolase, EC 3.1.1.7) which preferentially reactivates. That the observed enzymatic activity truly resides in acetylcholinesterase is indicated by its sensitivity to a specific inhibitor and by molecular weights for subunits and native enzyme which are approximately the same as those for the major fraction of enzymatic activity which behaves in the classical manner. The Km values for phenyl acetate of the two components are similar but the rate constant for covalent bond formation, K_2 with isopropyl m-nitrophenyl methylphosphonate is greatly reduced in the spontaneously reactivating species. The molecular basis for these observations is discussed.

77-2385 Butcher, J. E. ; Boyer, M. G.; Fowle, C. D. (Dept. Biol., York Univ., Downsview, Ontario, Canada)

Some changes in pond chemistry and photosynthetic activity following treatment with increasing concentrations of chlorpyrifos. *Bull. Environ. Contam. Toxicol.* 17(6): 752-758; 1977. (11 references)

A representative series of chemical data from ponds treated with increasing concentrations of chlorpyrifos are presented to illustrate the scope, magnitude and duration of the response and some evidence for its underlying causes. Chlorpyrifos was used at concentrations of 1.0, 0.01, and 0.04 ppm. The pesticide brought about an enhancement of algal growth in aquatic environments. The diversity of the growth, primarily green and blue-green, suggests a nonselective process depending at least in part on the species prevalent at the time the application was made. The virtual complete elimination of zooplankton by 48 hours followed by the development of algal blooms, supports the concept of reduced grazing pressure as an explanation for the initiation of blooms by the pesticide.

77-2386 Daughton, C. G. ; Hsieh, D. P. H. (Univ. California, Dep. Environ. Toxicol., Davis, CA 95616) **Accelerated parathion degradation in soil by inoculation with parathion-utilizing bacteria.** *Bull. Environ. Contam. Toxicol.* 18(1): 48-56; 1977. (23 references)

The feasibility of using microorganisms for the decontamination of environmental pollutants has recently been recognized. A mixed acclimated bacterial culture was selected and enriched for growth on parathion as sole carbon source, then inoculated into silt loam soil samples fortified with parathion and incubated at ambient temperature and water content. In the absence of the acclimated culture 80% of the parathion was receovered after 11 days in non-autoclaved, non-flooded soil. Less than 15% of added parathion was recoverable after 4 days of incubation in soil with added acclimated culture. Amendment with yeast extract or glucose delayed the onset of parathion degradation, indicating possible diauxic growth. Parathion recoveries exceeded 90% after 11 days of incubation for all specimens under flooded soil conditions. When inoculated into autoclaved soil the acclimated culture maintained full activity for up to three weeks in the absence of parathion, with or without yeast extract. After 2 weeks of incubation in the absence of parathion the acclimated culture in non-autoclaved soil was less able to degrade parathion. The acclimated culture was capable of degrading nearly 100% of a parathion concentration as high as 5000 ppm within 3 weeks, but at 10,000 ppm the degradation efficiency was greatly reduced, probably due to toxicity of detergents and/or xylenes in the formulation.

77-2387 Sundaram, K. M. S. ; Hopewell, W. W.; Lafrance, G. (Chem. Control Res. Inst., Ottawa, Ontario, Canada) **Uptake, translocation and metabolism of C-14 acephate in spruce trees.** *Chem. Control Res. Inst.* Report No. CC-X-139, 31 p.; 1977. (19 references)

The uptake, translocation and metabolism of C-14 acephate was studied in white spruce, *Picea glauca* (Moench), under normal forest conditions. The insecticide was given by trunk implantation treatment (TIT), basal bark painting (BBP), and foliar painting (FP). The insecticide penetrated the treated region and translocated apoplastically via xylem vessels in different tree parts depending on the mode of application. Uptake and foliar accumulation through xylem transport were high in TIT, considerably less in BBP, and least in FP. Autoradiographic studies confirmed the acropetal translocation of the radiolabel via the transpiration stream into the young and growing spruce foliage. The acephate residues in foliage by TIT gradually decreased through metabolic and chemical processes forming methamidophos and other polar conjugates. Since the residue levels of methamidophos in foliage were low compared to acephate, the primary detoxification process was through the rupture of P-N, P-O, and P-S bonds instead of the N-C bond in the molecule forming phosphoric acid derivatives. The insecticide present on the foliage in FP was rapidly lost due to various physical processes whereas the adsorbed residues were persistent due to their inclusion in the lipophilic material of the cuticle. Acephate was found systemic to some extent, and this potential is evaluated for budworm control.

77-2388 Sundaram, K. M. S. ; Hopewell, W. W. (Chem. Control Res. Inst., Ottawa, Ontario, Canada) **Penetration, translocation and fate of C-14 aminocarb in spruce trees.** *Chem. Control Res. Inst.* Report No. CC-X-140, 25 p.; 1977. (5 references)

Studies were conducted on the translocation, persistence, and fate of carbonyl C-14 aminocarb in white spruce, *Picea glauca* (Moench) Voss, trees under normal weathering conditions. The chemical was apoplastically accumulated by xylem transport in branches and foliage when applied by trunk implantation treatment. The major route of translocation of the radiolabel is acropetal, from the old to the newly developing foliage. The residue levels were low when applied by foliar painting and insignificant in basal bark painting. The absorbed aminocarb was gradually lost after 64 days following trunk implantation, probably due to hydroxylation forming water soluble metabolites, some of which became persistent due to their incorporation into cellular structure of the foliage. The mechanism of dissipation of the insecticide from the treated surfaces appeared to be due to physical rather than metabolic processes. It appears that the material is weakly systemic and labile but more research is required to elucidate its mechanism of dissipation and metabolism.

77-2389 Sundaram, K. M. S. ; Hopewell, W. W. (Chem. Control Res. Inst., Ottawa, Ontario, Canada) **Systemic behaviour and fate of C-14 phosphamidon in spruce trees.** *Chem Control Res. Inst.* Report No. CC-X-141, 27 p.; 1977. (13 references)

The uptake rate, translocation and fate of phosphamidon was studied in spruce trees, *Picea glauca* (Moench) Voss, under conditions of forest environment and foliar painting techniques. The chemical was apoplastically accumulated by xylem transport in branches and foliage when injected into the tree trunk. The major route of translocation was acropet-

al, from the old to the newly flushed foliage. Residue levels were low when the material was brushed on the basal bark and foliage. Translocated phosphamidon after trunk implantation was lost within 34 days, possibly by enzymatic breakdown forming polar metabolites some of which became persistent due to their incorporation into the cellular structure of spruce foliage. The mechanism of dissipation appeared due to physical rather than to metabolic processes. Consequences arising from the systemic behavior of the chemical are discussed in relation to practical applicability of the insecticide in forest pest control programs.

77-2390 Arrhenius, E. ; Renberg, L.; Johansson, L. (Environ. Toxicol. Unit, Wallenberg Lab., Univ. Stockholm, Lilla Frescati, 104 05 Stockholm 50 (Sweden)) **Subcellular distribution, a factor in risk evaluation of pentachlorophenol.** *Chem. Biol. Interact.* 18(1): 23-34; 1977. (27 references)

The potent mitochondrial phosphorylator PCP also interferes with microsomal detoxication functions in vitro. This results in an advantage for flavin mediated oxygenation compared with flavin-cytochrome P-450 dependent reactions. To discriminate between proposed action mechanisms of PCP (disturbance of energy conversion, synergism of other chemicals' action, and direct disturbance to function of cell organelles) the localization of PCP in subcellular organelles was investigated. PCP concentrations in various liver subcellular organelles of rats treated orally with this substance were determined using zonal centrifugation. The microsomal fraction and the cytosol appeared to hold the highest PCP concentrations. The mitochondrial PCP concentration is only 1/3 of that in the cytosol. Taking the PCP concentration differences into account the sensitivity of mitochondria and microsomes to PCP appear to be similar. Mitochondria can maintain a PCP concentration threefold less than that in their surrounding medium, the cytosol. Thus it appears that intracellular energy depletion may represent the dominant effect of PCP in an environment where levels of other environmental toxicants are low, whereas the synergistic action may predominate in the presence of chemicals which are metabolized to reactive intermediates in disturbed detoxication systems.

77-2391 Arrhenius, E. ; Renberg, L.; Johansson, L.; Zetterqvist, M. A. (Environ. Toxicol. Unit, Wallenberg Lab., Univ. Stockholm, Lilla Frescati, S-104 05 Stockholm 50, (Sweden)) **Disturbance of microsomal detoxication mechanisms in liver by chlorophenol pesticides.** *Chem. Biol. Interact.* 18(1): 35-46; 1977. (21 references)

Several chlorophenols are known to be potent uncouplers of mitochondrial oxidative phosphorylation in vitro, and certain phenolic compounds have been shown to interfere with the microsomal detoxication enzyme electron transport chain in cells. Investigations were conducted to determine whether chlorophenols generally have such an effect. The microsomal metabolism of *N,N*-dimethylaniline to formaldehyde and methylaniline (*C*-oxidation) or to *N,N*-dimethylaniline -*N* – oxide (*N*-oxidation) was taken as a measure of the intact function of the microsomal detoxication chain; increases in the *N*-oxidation/*C*-oxidation ratio indicate disturbances of electron transport. After a slight rise at 0.03 mM PCP, the *C*-oxygenation decreases with increasing PCP concentrations and is only 15% of the original activity at 1.0 mM. At the same time *N*-oxygenation rises slightly, with a net effect of a sharp increase in the *N*-oxygenation/*C*-oxygenation ratio. Other chlorinated phenols (di-, tri-, and tetrachlorophenols, biphenols, and chlorinated dihydroxydiphenyl ethers produced similar but slighter effects. The stimulatory effect at *N*-oxygenation is reached only at a higher concentrations. The inhibition of *C*-oxygenation obtained with 1.0 mM PCP is already well manifested at the beginning of incubation, indicating that PCP itself rather than a metabolite is responsible for the inhibition.

77-2392 Schom, C. B. (Univ. California, Davis, CA) **Genetic and environmental relationships of two avian species treated with the organophosphate pesticide azodrin.** *Diss. Abstr. Int. B* 38(1): 65; 1977.

Azodrin (monocrotophos) was administered to two chicken populations (White Leghorn and Australorp) and a Bobwhite quail population. The two species differed in embryonic development. Micromelia and parrot beak were evident in the chicken embryos. The quail embryos were amuscular. Acetylcholinesterase activity was suppressed in all species. These differences were also apparent when 11 other insecticides were administered. Azodrin was also administered in combination with nicotinamide. During these treatments the chicken embryos appeared to recover morphologically but there was no increase in enzymatic activity. Quail eggs remained abnormal throughout both series of treatments. The abnormal development of the White Leghorn embryo was initiated at a threshold concentration of 0.4 ppm. Australorp embryos were severely deformed at this level. Due to the emphasis on genetic differences, the treatment levels should be established according to the breed of bird and focus on teratogenesis, a heritable response as opposed to embryonic mortality.

77-2393 Menn, J. J. ; Still, G. G. (Stauffer Chem. Co., Mountain View Res. Ctr., Mountain View, CA) **Metabolism of insecticides and herbicides in higher plants.** *Crit. Rev. Toxicol.* 5(1): 1-21; 1977. (90 references)

Pesticides, widely applied to increase food supplies, undergo various transformations in living organisms and in soil. A large number of investigations have been conducted on the absorption, translocation, and metabolism of pesticides in higher plants. Reactions identified include dehydrohalogenation and halogenation, desulfuration, epoxidation, hydrolysis, hydroxylation, isomerization, *N*-dealkylation, *O*-dealkylation, oxidation, reduction, and conjugation. Such studies have provided useful information on intermediate and terminal metabolites as well as indications regarding the mode of action of pesticides.

77-2394 Vos, J. G. (Lab. Pathol., Natl. Inst. Pub. Health, Bilthoven, The Netherlands) **Immune suppression as related to toxicology.** *Crit. Rev. Toxicol.* 5(1): 67-101; 1977. (164 references)

Only a limited number of chemicals have been shown in toxicity studies to have immunosuppressive properties, and the cell-mediated immunity in particular has been poorly studied. Current procedures for toxicity testing underestimate the importance of the immune system. The body is protected by a specific immunity based on the establishment of immunological memory of a substance as well as a nonspecific resistance system including lytic mechanisms and complement (properdin pathway). There is now abundant evidence for the existence of two distinct but not entirely independent specific immunity systems: cell-mediated immunity and humoral immunity. The concept of the mononuclear phagocyte system has recently been coined to replace the concept of the reticuloendothelial system, covering fixed and free macrophages and their precursors. A discrimination must be made from the toxicologic viewpoint between direct effects on the immune systems and indirect effects exerted, e.g., via nutritional deficiencies, pathogenic organisms, and changes in endocrine balance. Procedures suitable for detecting immune suppression in routine toxicity studies are presented, and for examining immune system function. Industrial compounds and environmental pollutants reported to increased susceptibility to infection or decrease immunological responsiveness are reviewed. These compounds include dioxin, tin compounds, lead and cadmium, arsenicals, DDT, PCB, dieldrin, and carbaryl.

77-2395 Korablev, M. V. ; Kurbat, N. M. (Dep. Pharmacol., Grodno Med. Inst. Grodno, USSR) **Proizvodnye ditiokarbaminovoi kisloty kak ingibitory biosinteza katekholaminov (Obzor literatury). [Dithiocarbamic acid derivatives as catecholamine biosynthesis inhibitors (Literature Review).]** *Farmakol. Toksikol.* 40(2): 230-238; 1977. (115 references) (Russian)

Recent studies on the effects of dithiocarbamic acid derivatives on the biosynthesis, biotransformation, and elimination of catecholamines are reviewed. Reduction of the norephinephrine concentration in the brain by 31-73% was observed in mice and rats following the i.p. administration of single doses of TMTD (0.0235-0.4 g/kg). TMTD (thiram) inhibits the conversion of dopamine into norepinephrine in the heart, adrenals and spleen of rats, guinea pigs, and hamsters. TMTD has no influence on the uptake and storage of norepinephrine in the heart and iris of the rats. Administered in doses which reduce the norepinephrine level, TMTD prevents the development of hyperthermia and motor excitation induced by phenamine in animals.

77-2396 Korsak, R. J. ; Sato, M. M. (Hawaii Epidemiol. Stud. Program, Pacific Biomed. Res. Cent., Univ. Hawaii, Honolulu, HI) **Effects of chronic organophosphate pesticide exposure on the central nervous system.** *Clin. Toxicol.* 11(1): 83-95; 1977. (17 references)

An index was developed to compare the amount of an individual's high and low levels of chronic organophosphate exposure to the relative amount of exposure. A series of neuropsychologic tests and EEGs were administered to 59 male volunteers with a history of occupational organophosphate exposure. Many of these participants were also exposed to organochlorines and carbamates. Seven tests from the Halstead Neuropsychological Test Battery were administered to the men. Four scalp locations were used to record the encephalograms; they were the left and right frontal lobe and the left and right occipital regions. Plasma cholinesterase levels were also measured. High levels of chronic exposure had a maximal effect on the frontal areas of the brain. It is primarily manifested as left frontal lobe dysfunction. The performance on the Tactual Performance Tests could not be correlated to chronic organophosphate exposures. Otherwise, this would indicate possible parietal dysfunction. Although this study was performed on mature nervous systems, these effects may be magnified in the developing central nervous system. It is suggested that organophosphate exposure may be a contributing factor of minimal brain dysfunction in the young.

77-2397 Wigowska-Sowinska, J. (Indep. Lab. Pathol. Nerv. Syst. Org. Senses, Med. Acad., Poznan, Poland) **Histochemical changes in brain after oral application of phenylmercuric acetate.** *Folia Histochem. Cytochem.* 15(2): 166-167; 1977.

Two groups of Wistar rats were treated orally with phenylmercuric acetate. One group was given 0.1 g of the fungicide for 10 days, and the other group was given 0.05 g for 30 days. The rats were sacrificed and the brains removed. Decreased acid phosphatase and ATP-ase were observed. TPP-activity increased. Changes in the activity of esterases were less noticeable.

77-2398 Sawicki, B. ; Kuczynski, M. (Dep. Histol. Embryol., Med. Acad. Bialystok, Poland) **Histochemical studies of thyroid gland C cells of rats in subacute phoschlore intoxication.** *Folia Histochem. Cytochem.* 15(2): 161; 1977.

Foschlor (trichlorfon) was administered in doses of 0.5, 0.2, or 0.1 LD50 per day for 21 days to 72 male white Wistar rats. Some of the animals were sacrificed 24 hours after the last administration of the substance. The rest were killed after nine days. Sections of thyroid gland were stained. The C cells were detected and stained. Reactions for succinate dehydrogenase, non-specific esterases and non-specific cholinesterase were performed. Cholinesterase activity was greatly affected in the C cells of the thyroid. Some changes in the content of cytoplasmic granules were also noted.

77-2399 Mann, S. K. (Dep. Biosci., Himachal Pradesh Univ., Summer-Hill, Simla-171005, India) **Cytological and genetical effects of dithane fungicides on *Allium cepa*.** *Environ. Exp. Bot.* 17(1): 7-12; 1977. (10 references)

The mutagenic activity of Dithane fungicides was tested on *Allium cepa*. The fungicides used were: Dithane M-22 (80% maneb), Dithane Z-78 (75% zineb), Dithane A-

40 (93% nabam), Dithane D-14 (22% nabam) and Dithane M-45 (80% mancozeb). These fungicides were sprayed in concentrations of 1000 and 1500 ppm on peduncles with inflorescence buds. Chromosome aberrations were induced by all five Dithane Fungicides. There was a higher frequency of chromosomal aberrations in the meiotic cells than somatic cells. This suggests a greater sensitivity of the reproductive cells to the fungicides. The Dithanes had similar effects on meiosis but in different percentages. This was attributed to the presence of different metal ions in the fungicides used. Pollen sterility was also observed.

77-2400 Fortak, W. ; Mlodecki, H.; Szadowska, A. (Dep. Histol. Embryol., Med. Acad. Lodz, Poland) **Morphological investigations of the influence of Dinokap of the (dinitrophenyl group) on some of the internal organs of laboratory animals in chronic and acute poisoning.** *Folia Histochem. Cytochem.* 15(2): 147; 1977.

Morphological changes in the stomach, intestines, liver and kidneys due to the administration of acute and subacute doses of dinocap (karathane) were investigated in white rats and rabbits. Degeneration and necrosis from acute poisoning were visible in the stomach. This was evident to a lesser extent in the kidney and liver. Changes in mitochondrial dehydrogenase and lysosomal hydrolases preceded morphological manifestations in the organs investigated. A relationship was found between the subacute dose of dinokap and the degree of manifestations of histological changes.

77-2401 Majewska, T. ; Warzyniak, W.; Cybulska, R. (Dep. Histol. Embryol., Agric. Acad. Lublin, Poland) **The influence of phosphoroorganic plant pesticides used in agriculture on the structure and histoenzymatic reactions in tissue of hamster.** *Folia Histochem. Cytochem.* 15(2): 155-156; 1977.

On the sixth day of gestation female hamsters were treated with PCB, CCC (chlormequat chloride), hexachlorophene, and fenchlorphos. Some fetuses were teratoid, others died. The activity of various phosphatases was studied in the skeletal system of each organism. It was found that atrophic changes in the cartilaginous and osseous system of ribs, sternum, limbs, visceral cranium and cerebral cranium corresponded to the irregular process of cartilage calcification.

77-2402 Rozewicka, L. (Dep. Histol. Embryol. Med. Acad. Szczecin, Poland) **The influence of insecticides on DNA in nuclei of spermatogonium B and in spermatozoons of white mice.** *Folia Histochem. Cytochem.* 15(2): 159-160; 1977.

The effects of pesticides on DNA levels in the nuclei of spermatogonium B and in spermatozoa were studied in white mice. The animals were divided into three experimental groups M, F, and S, and a control group K. Those in group M and S were administered the pesticides through a metal cannula to the digestive tract. Group M was given 5 ml of a 1% aqueous solution of Metrox-30 (methoxychlor) daily. A 5 ml dose of a 0.3% solution of Sadofos-30 (malathion) was given to group S. Foschlor-50 (trichlorfon) in 0.3% solution was given *ad libitum* to the F group as drinking water. The control group, K, was given well water. (The results of these tests were not presented in the original).

77-2403 Osada, A. (Dep. Histol. Embryol., Med. Acad., Wroclaw, Poland) **Histochemical and biochemical investigations of the influence of "insects fos fluid" on mammary gland of white mice in lactation period.** *Folia Histochem. Cytochem.* 15(2): 157-158; 1977.

Pregnant mice were intoxicated with "Insect fos fluid" (fenitrothion) from the seventh day of pregnancy to the ninth day of lactation. The animals were divided into two groups: those receiving orally a 0.3 ml aqueous solution of fenitrothion at a concentration of 250 mg/kg and a control group receiving 0.3 ml distilled water daily. Extracts of mammary glands were evaluated for enzyme activity. Decreases in the activity of succinate dehydrogenase, glucose-6-phosphate dehydrogenase, and phosphogluconate dehydrogenase were detected. The acid phosphatase and lactate dehydrogenase activity increased. The lipid content of the mammary gland extract lessened.

77-2404 Sitkiewicz, D. ; Bicz, W. (Dep. Drug Metab., Med. Acad., Warsaw, Poland) **Bioenergetics of brain phosphoroorganic pesticide intoxication.** *Folia Histochem. Cytochem.* 15(2): 162; 1977.

Phosphoric acid (dichlorvos) and phosphonic acid (trichlorfon) altered the activity of succinic dehydrogenase and cytochrome oxidase in the brain and liver mitochondria of rats. There was a noticeable increase in glycogen levels and a decrease of glucose-6-phosphate dehydrogenase activity. Oxidative phosphorylation was unaffected. In vivo fenchlorphos (a thiophosphonate) interfered with oxidative phosphorylation in the liver mitochondria. In vitro administration of fenchlorphos affected oxidative phosphorylation in both liver and brain mitochondria accompanied by a decrease in glycogen levels and glucose-6-phosphate dehydrogenase activity. This suggests that the mechanism involved in the metabolism of thiophosphonates differs from that for phosphates and phosphonates.

77-2405 Woroniecka, G. ; Kuczynski, M.; Sawicki, B. (Dep. Hist. Embryol., Med. Acad. Bialystok, Poland) **Investigations of influence of subacute foschlor intoxication on morphology and histochemistry of rat pancreas.** *Folia Histochem. Cytochem.* 15(2): 167; 1977.

Foschlor is the name for the trichlorfon formulation produced in Poland. The morphology and histochemistry of the pancreas were examined in 70 Wistar rats, 4-5 mo old and weighing 220-250 g, given trichlorfon at 0.5, 0.2, or 0.1 LD50. The rats were treated orally with these pesticide doses each day for 21 days and killed on the first or ninth day after administration of the last dose. Pancreas sections were stained with hematoxylin and eosin and by the azan method;

the islets of Langerhans were stained by the method of Gomori in the modification according to Scott. Alkaline and acid phosphatases were also detected histologically. Morphological and histochemical changes were observed both in the vesicle cells and in the islets of Langerhans. The observed changes were dose-related.

77-2406 Sato, C. (Author address not given) **[On myopia due to organophosphorus pesticides.]** *Ganka Rinsho Iho (Jap. Rev. Clin. Ophthalmol.)* 71(7): 82-83; 1977. (Japanese)

Observations were performed on young monkeys whose eyes were irrigated with eserine for a long time, resulting in myopia and miosis without a change in the ocular axis. Otsuka observed myopia in a dog treated for 2 years with high levels of an organophosphorus pesticide (total amount corresponding to 18-55 g for a human). These observations indicate that organophoshorus pesticide intoxication is not the major cause of the recently reported increase in acquired myopia, contrary to the opinion of Ishikawa. False conclusions may have been due to inadequacy of statistical treatment, misunderstanding of results of atropine-eye wash, scarcity of abnormal visual field and papillitis in rural districts (possibly polluted by pesticides) compared to cities, and emmetropic persons becoming more numerous in rural districts. In contrast to the opinion of Ishikawa with his positive findings on beagles, the author insisted that although administration of large amounts of a chemical resulted in a symptom, and a minute amount of the chemical was detected in the person with the symptom, it is not correct to deduce that a chemical which is present in the environment in minute amounts is the major cause of the symptom.

77-2407 Anonymous **Chronicle.** *Folia Histochem. Cytochem.* 15(2): 143; 1977.

The Fourteenth Symposium of the Polish Histochemical and Cytochemical Society was held in Poznan, May 26-28, 1976, with 178 participants including six international representatives. One of the three scientific sections dealt with cytochemical and histochemical changes in industrial and agricultural intoxications. The other dealt with new cytochemical and histochemical methods and the structure and function of the Golgi apparatus. A total of 91 papers were presented.

77-2408 Rankin, P. W. ; Surak, J. G.*; Thompson, N. P. (Pestic. Res. Lab., Food Sci. Dep., Univ. Florida, Gainesville, FL 32611) **Effect of benomyl and benomyl hydrolysis products on *Tetrahymena pyriformis*.** *Food Cosmet. Toxicol.* 15(3): 187-193; 1977. (19 references)

The toxicity of the fungicide benomyl (methyl-1- (butylcarbamoyl) -2- benzimidazol-2-yl carbamate) was evaluated at the molecular level using the ciliated protozoan *Tetrahymena pyriformis* as a model eukaryotic cell system. Growth of *T. pyriformis* was inhibited in a dose-related manner by benomyl and two major hydrolysis products, methylbenzimidazol-2-yl carbamate (MBC) and butyl isocyanate (BIC). A minor degradation product, 2-aminobenzimidazole (2-AB) had no effect on growth. Light-microscopic observations of the organisms revealed a slowing of cellular motility and the development of rounded cells after exposure to 20 ppm benomyl or BIC in the incubation medium. After the cells became immobile, part of the cell membrane appeared to separate, swell and form a bubble along the side of the cell. Similar concentrations of MBC and 2-AB had no apparent morphological effect upon the cells. Increasing the concentration of benomyl decreased the incorporation of [^{14}C]acetate and [^{14}C]amino acids into protein and [^{3}H]uridine into RNA. The incorporation of [^{14}C]acetate into lipids and of [^{3}H]thymidine into DNA increased with benomyl concentrations of 5 ppm, but a decrease in incorporation occurred with higher concentrations. (Author abstract by permission)

77-2409 Lijinsky, W. ; Taylor, H. W. (Carcinogenesis program, Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN) **Transplacental chronic toxicity test of carbaryl with nitrite in rats.** *Food Cosmet. Toxicol.* 15(3): 229-232; 1977. (9 references)

Pregnant female rats were given by gavage a total of 300 mg carbaryl during a 10-day period. No malignant tumors were induced in the dams or their offspring during their natural lifespan. Pregnant and non-pregnant female rats were given a suspension of carbaryl in sodium nitrite solution on several successive days, a total of 90 mg carbaryl and 120 mg sodium nitrite being administered to each adult rat. There was no significant incidence of malignant tumors in the dams or their offspring as a result of the treatment. (Author abstract by permission)

77-2410 Koschier, F. J. ; Berndt, W. O. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Ctr., Jackson, MS 39216) **Evaluation of acute and short-term administration of 2,4,5-trichlorophenoxyacetate with respect to renal proximal tubular transport.** *Food Cosmet. Toxicol.* 15(4): 297-301; 1977. (24 references)

Previous studies in rats demonstrated that a single dose (45-90 mg/kg) of 2,4,5-trichlorophenoxyacetate (2,4,5-T) reduced the transport of organic acids and bases in slices of renal cortex taken from the treated animals. Upon repeated daily administration of 2,4,5-T to rats, the daily rate of excretion of this herbicide increased after initial retention until 100% of the daily dose administered was excreted within 24 hr. However, the ability of renal slices to transport organic ions was not facilitated during this period of increased excretion; in fact, a significant depression in transport was still measured. Additionally, the high degree of binding of 2,4,5-T by renal cortical homogenates from untreated rats was not altered by pretreatment of the rats with 90 mg 2,4,5-T/kg. Single or repeated administration of the herbicide at the lower dose of 20 mg/kg did not alter the transport of organic ions significantly. From these data and others, it appears that the susceptibility of rats to the toxicity of 2,4,5-T is directly related to the ability of the animals to excrete high doses of this herbicide.

77-2411 Kennedy, G. L., Jr. ; Smith, S. H.; Kinoshita, F. K.; Keplinger, M. L.; Calandra, J. C. (Industrial Bio-Test Labs., Inc., Northbrook, IL 60062) **Teratogenic evaluation of piperonyl butoxide in the rat.** *Food Cosmet. Toxicol.* 15(4): 337-339; 1977. (8 references)

Groups of pregnant albino rats were treated by gavage with doses of either 300 or 1000 mg piperonyl butoxide/kg. The compound was administered daily from day 6 to 15 of gestation. Controls received the corn oil vehicle alone. There was no reduction in body-weight gain in the test groups during the dosing period; maternal growth over the entire gestation period was slightly reduced but no dams died. Numbers of corpora lutea, implantations, resorptions and viable foetuses per female were not altered by exposure to piperonyl butoxide. Complete external examination, as well as evaluation of internal and skeletal structure, revealed no structural alterations that might be related to chemical treatment. It is concluded that piperonyl butoxide is not teratogenic in the rat at levels below those that are toxic to the dams.

77-2412 Pritchard, J. B. ; Karnaku, K. J., Jr.; Guarino, A. M.; Kinter, W. B. (Dep. Physiol., Med. Univ. South Carolina, Charleston, SC 29401) **Renal handling of the polar DDT metabolite DDA (2,2-bis(*p*-chlorophenyl) acetic acid) by marine fish.** *Am. J. Physiol.* 233(2): Fl26-Fl32; 1977. (30 references)

Renal handling of DDA was studied in isolated tubules of the winter flounder (*Pseudopleuronectes americanus*) in vitro. Renal clearance studies were also performed in the flounder and in the goosefish (*Lophius americanus*), which is aglomerular. Both uptake studies and autoradiography in vitro showed extensive energy-dependent accumulation within the cytoplasm of tubular cells and the tubular lumen. Both *p*-aminohippurate and chlorophenol red strongly inhibited uptake. Tissue binding accounted for a second uptake component, as indicated by the insensitivity of the uptake to metabolic inhibitors or organic acids. Both species displayed probenecid-inhibited net secretion in vivo. Comparison of DDA and DDT distribution and excretion pointed up the importance of the greater water solubility of DDA and of its secretory transport, since DDA was excreted at over 200 times the rate of DDT. Liver, kidney, and bile also presented high tissue-to-plasma DDA ratios. The organic acid system therefore mediates the accumulation and excretion of DDA in these fish.

77-2413 Gosalvez, M. ; Diaz-Gil, J.; Coloma, J.; Salganicoff, L. (Bioquim. Exper., Clin. Puerta di Hierro, Fac. Med., Univ. Autonoma, Madrid, Spain) **Spectral and metabolic characteristics of mitochondrial fractions from rotenone-induced tumours.** *Brit. J. Cancer* 36(2): 243-253; 1977. (30 references)

Primary mammary fibroadenomas were induced in Wistar rats by injection of rotenone at 0.7 μg/g body weight for 40-50 days. The tumors usually appeared 7-10 mo after the end of treatment. Transplanted tumors were obtained by subcutaneous implantation of small pieces of primary tumors, suspended in saline. The mitochondrial fractions isolated from these tumors lacked respiratory control and oxidative phosphorylation, were partially or totally insensitive to cyanide, and had near-normal respiratory carrier contents. These characteristics are more similar to those of mitochondria from atrophic mammary gland than to those of mitochondria from spontaneous mammary adenomas. The characteristic structural and biochemical mitochondrial alteration in rotenone-induced tumors thus appears to be a lack of mitochondrial differentiation as the tumor develops from the atrophic mammary gland. The insensitivity of rotenone-induced tumors to oligomycin and dinitrophenol indicates that glycolysis is their sole source of metabolic energy.

77-2414 Laskowski, M. B. ; Olson, W. H.; Dettbarn, W. D. (Dep. Pharmacol., Vanderbilt Univ. Sch. Med., Nashville, TN 37232) **Initial ultrastructural abnormalities at the motor end plate produced by a cholinesterase inhibitor.** *Exp. Neurol.* 57(1): 13-33; 1977. (21 references)

Paraoxon has been shown to produce progressive myopathy in rat diaphragm and leg muscles in 24 hr after subcutaneous injection. Augmented transmitter release and rapid spontaneous nerve activity were recorded in electrophysiological studies in diaphragm muscle within 30 min after paraoxon injection. The ultrastructural changes occurring at the motor end plates of diaphragm and soleus muscles during this period of increased neuromuscular activity were observed. Cytoarchitecture became disturbed beneath the motor end plates of diaphragm muscles 30 min after paraoxon. The activity consisted of dilated mitochondria and expanded sarcoplasmic reticulum. The average extent of the pathologically altered area from the nerve terminal membrane was 8.0 m. The first light microscopic lesions became visible 6 hr after paraoxon. All endplates displayed some subsynaptic disorganization; the severity varied widely. Nerve terminals contained accumulations of coated vesicles. Subsynaptic folds were widened and often contained membrane-bound vesicles. Necrotic fibers were observed in association with the most severely affected end plates. The end plates of soleus fibers were less severely affected and no lesions were observed under the light microscope at this time. Reactivation of acetylcholinesterase with pralidoxime presented end plate abnormalities and fiber degeneration if administered 10 min after paraoxon.

77-2415 Olefir, A. I. ; Mintser, O. P.; Sova, R. E. (Kiev Sci. Res. Inst. Occup. Hyg. Indust. Med., Kiev, USSR) **O vzaimosvyazi pokazatelei estestvennoi rezistentnosti organizma pri khronicheskoi intoksikatsii khlorofosom, polikhlorpinenom i sevinom. [Interrelation of indices of innate defenses in chronic intoxication with chlorophos, polychloropinene, and sevin.]** *Gig. Sanit.* 42(4): 25-28; 1977. (7 references) (Russian)

Rats were given 1/20 LD50 doses of sevin (carbaryl), chlorophos (trichlorfon), or polychloropinene (strobane) by stomach tube for up to 4.5 mo, and the correlated effects on

the non-specific defensive factors were examined. The factors which were examined in paired tests included complement-lysozyme, complement- β-lysine, complement-phagocytosis index, lysozyme-β-lysine, lysozyme-phagocytosis index, lysozyme-digestive index, β-lysine-phagocytosis index, phagocytosis index-digestive index, and bactericidal activity of the skin versus skin autoflora. These factors showed individual and paired time-related differences, which could be used to assess the occurrence and duration of various stages of the adaptive process as compared to the development of toxic manifestations. The most significant relationship existed between quantity of complement, quantity of β-lysine, and the leukocyte phagocytosis and digestive activity.

77-2416 Popov, T. A. ; Kagan, Yu. S. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plastic Materials, Kiev, USSR) **Perfuziia pecheni krysy kak odin iz toksikologicheskikh metodov v gigienicheskikh issledovaniiakh [Perfusion of the rat liver as a toxicologic method in hygienic studies.]** *Gig. Sanit.* 4: 40-45; 1977. (8 references) (Russian)

The suitability of the perfusion of the isolated rat liver in hygienic toxicological studies of pesticides and other toxic substances was investigated. The pesticides were added to the perfusate immediately before the liver, and metabolic and other processes were assessed by chemical analysis of the perfusate behind the liver. Dursban (chlorpyrifos, 20 μg/ml of perfusate) was retained in the extracellular space of the liver. The P=O analog of dursban was practically undetectable in the liver, but it was found in high concentration in the perfusate. The mathematical models elaborated make it possible to predict the pesticide concentration in the perfusate at any moment. The effect of trichlorfon, polychloropinene (strobane), and TMTD (thiram) on the protein-synthesizing function of the liver was studied with the pesticides added to an amino acid mixture in Locke-Ringer solution used for perfusion. The pesticides caused a considerable depression of protein synthesis; the findings were similar to those obtained after oral administration of the pesticides to rats. The findings indicate the suitability of liver perfusion in toxicological studies.

77-2417 Gurova, A. I. ; Alekseeva, N. P.; Gorlova, O. E. (P. Lumumba Peoples' Friendship University, Moscow, USSR) **Materialy po otsenke toksichnosti metilkhlorformiate. [Data for the assessment of the toxicity of methylchloroformate.]** *Gig. Sanit.* 5: 97-99; 1977. (2 references) (Russian)

The acute and chronic toxicity of methylchloroformate, recommended as an agricultural fungicide, were studied. The odor threshold was determined to be 1 mg/m³ in humans. The acute oral LD50 values were found to be 67 mg/kg in mice, 60 mg/kg in rats, and 140 mg/kg in guinea pigs. Pronounced skin resprption was observed, and the cutaneous LD50 was found to be 1,750 mg/kg in mice. Slight hyperemia and pigmentation of the skin were observed after repeated applications. Methylchloroformate caused inflammation, suppuration, and poisoning when introduced into the conjunctival sac of the animals. The acute inhalatory LD50 is 450 mg/m³ in rats and 185 mg/m³ in mice. The cumulation coefficient equals 2.5. Chronic inhalation tests showed that the highest ineffective concentrations are 0.185 mg/m³ for mice and 0.197 mg/m³ for rats. The findings indicate that methylchloroformate is a highly toxic compound with pronounced skin resorption and cumulation.

77-2418 Malenky, V. P. (N. I. Pirogov Med. Inst., Vinnitsa, USSR) **Gistologicheskie izmeneniya v organakh eksperimental'nykh zhivotnyk, vyzvannye pochvennoi pyl'yu, khimicheskimi udobrenimayi i yadokhimikatami. [Histological changes in organs of experimental animals caused by soil dust, chemical fertilizers and chemical poisons.]** *Gig. Sanit.* 6: 15-18; 1977. (Russian)

To examine the various factors responsible for organ damage following agricultural exposure groups of Wistar rats were treated intratracheally with soil-vegetable dust adulterated with other agricultural materials. The first group received 50 mg of soil-vegetable dust containing 12% free silicon dioxide; the second group received 10 mg of a chemical fertilizer combination; the third group was given the dust plus 0.01 LD50 (3.5 mg/kg) of PCP; and the fourth group was given a combination of the preceding materials. Lung damage was evident in animals killed at 1, 2 and 3 mo after administration of these materials. The lung changes included catarrhal-desquamative bronchitis, peribronchitis, interstitial pneumonia, bronchiectasis, diffuse pneumosclerosis and emphysema. Other parenchymatous organs displayed protein dystrophy of the cells. The most extensive changes were seen in animals of the fourth group.

77-2419 Uga, S. ; Ishikawa, S.; Mukuno, K. (Dep. Ophthalmol., Kitasato Univ. Sch. Med., Sagamihara, Kanagawa, Japan.) **Histopathological study of canine optic nerve and retina treated by organophosphate insecticide.** *Invest. Ophthalmol. Visual Sci.* 16(9): 877-881; 1977. (8 references)

To evaluate the chronic toxic effects of organophosphate insecticide on the retina and the optic nerve adult beagle dogs were given ethylthiometon in gelatine capsules corresponding to 0.5, 1.0, or 1.5 mg/kg/day, 5 days a week for 2 years. The eyes and optic nerve were examined one week after termination of organophosphate administration. The optic nerve of all treated animals was affected; the number of myelinated axons was markedly reduced. These axons were replaced by delicate astrocyte processes. Changes in the retina were mild and were mainly seen in the peripapillary pigmented epithelial cells and in the Mueller cells of the peripheral retina. The mechanism of these effects was unknown, but it was concluded that the histological appearance of axonal degeneration might be due to a direct toxic action of ethylthiometon or its metabolites on the neurotrophism. The organophosphate might have affected the axoplasmic transport within the nerve fibers of the optic nerve. The pathological changes in the pigmented epithelium in the peripapillary region seemed to be the result of optic disc edema caused by the organophosphate.

77-2420 Walter-Echols, G. ; Lichtenstein, E. P. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706) **Microbial reduction of phorate sulfoxide to phorate in a soil-lake mud-water microcosm.** *J. Econ. Entomol.* 70(4): 505-509; 1977. (9 references)

Pesticide contaminated agricultural soils can be transported with water into rivers and lakes, where in most cases they end up as bottom deposits. By utilizing a loam-lake mud-water microcosm, the reduction of phorate sulfoxide, an oxidation product of the insecticide phorate, was demonstrated. With flooded phorate sulfoxide-treated loam soil, only small amounts of phorate were produced. The addition of lake mud, however, dramatically increased reduction of phorate sulfoxide to phorate, which after 2 wk of incubation accounted for 44% of the totally recovered residues. Exposure of *Drosophila melanogaster* Meigen to dry residues of extracts of phorate sulfoxide-treated loam soil, deposited on top of lake mud under flooded conditions, indicated an increase in toxicity due to the production of phorate. This reduction of phorate sulfoxide to phorate was the result of the activity of microorganisms, which in turn was dependent on the supply of organic nutrient sources. Thus, addition of glucose to this system further enhanced the reduction of phorate sulfoxide to phorate. Phorate sulfone, another oxidative product of phorate in aerobic agricultural soils, was not reduced to phorate sulfoxide or to phorate. (Author abstract by permission)

77-2421 Darda, S. (Dep. Biochem., C. H. Boehringer Sohn, 6507 Ingelheim, Germany) **Absorption, metabolism and excretion of the fungicide triforine in the rat.** *Pestic. Sci.* 8(3): 193-202; 1977. (11 references)

Eighty per cent of orally administered triforine is absorbed by the rat. Maximum blood levels are reached 4 hr after administration. After complete metabolic conversion has occurred, the fungicide absorbed is excreted mainly in the urine as a metabolite, *N*-[2,2,2-trichloro- 1-(piperazin-1-yl) ethyl] formamide. Elimination is complete with most of the compound being excreted during the first 24 hr following administration. (Author abstract by permission)

77-2422 Unai, T. ; Casida, J. E.* (Lab. Pestic. Chem. Toxicol., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Synthesis of isomeric 3-(2,2-dichlorovinyl) -2-hydroxymethyl -2- methylcyclopropane carboxylic acids and other permethrin metabolites.** *J. Agric. Food Chem.* 25(5): 979-987; 1977. (27 references)

Synthesis procedures are given for the following [1 *RS, trans*]- and [1 *RS, cis*]permethrin metabolites and related compounds: four isomeric 3-(2,2-dichlorovinyl)- 2-hydroxymethyl- 2-methylcyclopropane carboxylic acids and two isomeric γ-lactones derived from the 2-*cis*-hydroxymethyl acids; 2'-, 3'-, 4'-, 5-, and 6-hydroxy derivatives of 3-phenoxybenzyl alcohol and of 3-phenoxybenzoic acid; ten permethrin isomers mono- or dihydroxylated at one or both of the acid and alcohol moieties; 12 methyl esters of L-amino acid conjugates of the acid moieties and of 3-phenoxybenzoic acid; the ethereal sulfate of 4'-hydroxy- 3-phenoxybenzoic acid. Twenty-nine of the compounds synthesized, or their glucuronide or glocoside conjugates, are found as permethrin metabolites in the mouse liver microsomal monooxygenase system or in mammals or insects. (Author abstract reprinted by permission of the American Chemical Society)

77-2423 Marshall, T. C. ; Dorough, H. W. (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506) **Bioavailability in rats of bound and conjugated plant carbamate insecticide residues.** *J. Agric. Food Chem.* 25(5): 1003-1009; 1977. (22 references)

The bioavailability of bound (unextractables) and conjugated (water solubles) carbamate insecticide residues from plants was investigated by administering the ^{14}C residues orally to female rats. After 2 days, 11.5 and 1.3% of the bound residues of carbofuran and carbaryl from bean plants were eliminated in the urine, while 85.1 and 98.1% were voided in the feces. Only 1.4 and 0.4% of the bound residues were detected in the bile. Croneton bound residues from sorghum exhibited a similar excretion pattern. Urinary excretion of conjugated metabolites of carbaryl, aldicarb, Croneton, and carbofuran was 87.7, 87.5, 81.2, and 64.8% of the respective dose after 36 h. Excretion in the feces did not exceed 10% of the administered water solubles while the bile contained 13 to 21% of the dose. These data demonstrated that bound residues of the carbamate compounds were very poorly absorbed from the gastrointestinal tract of rats, while the conjugated ones were readily absorbed. (Author abstract reprinted by permission of the American Chemical Society)

77-2424 Akhtar, M. H. ; Foster, T. S. (Anim. Res. Inst., Res. Br., Agric. Canada, Ottawa, Ontario, Canada K1A 0C6) **Metabolism of tetrachlorvinphos by the soluble fraction (105,000 *g*) from chicken liver homogenates.** *J. Agric. Food Chem.* 25(5): 1017-1022; 1977. (14 references)

The soluble fraction (105 000 *g*) from chicken liver homogenates contains an enzyme(s) which metabolizes tetrachlorvinphos. Studies which employed the [^{14}C]vinyl-labeled insecticide indicated that the reaction was glutathione dependent. The primary step was demethylation to desmethyl tetrachlorvinphos, a water-soluble metabolite. It was shown that GSH acts as an acceptor for the transferred methyl group to form *S*-methylglutathione. The soluble fraction contains enzymes other than glutathione *S*-alkyltransferase. The polar fraction was further metabolized to benzene extractable compounds which were identified as 2,4,5-trichloroacetophenone, 1-(2,4,5-trichlorophenyl) ethanol and 2-chloro-1- (2,4,5-trichlorophenyl) ethanol. (Author abstract reprinted by permission of the American Chemical Society)

77-2425 Knowles, C. O. ; Benezet, H. J. (Dep. Entomol., Univ. Missouri, Columbia, MO 65201) **Mammalian metabolism of chlordimeform. Formation of metabolites containing the urea moiety.** *J. Agric. Food Chem.* 25(5): 1022-1026; 1977. (11 references)

The metabolism of chlordimeform-^{14}-C following intraperitoneal treatment of mice and oral treatment of rats and following incubation with rat liver microsomes was examined. In addition to chlordimeform and other previously identified metabolites such as *N*-(4-chloro- *o*-tolyl)- *N*-methyl formamidine, 4′-chloro- *o*-formotoluidide, 4-chloro-*o*-toluidine, *N*-formyl- 5-chloroanthranilic acid, and 5-chloroanthranilic acid, the following novel metabolites were present: *N*-(4-chloro-*o*-tolyl) formamidine, 1,1-dimethyl-3-(4-chloro-*o*-tolyl)urea, 1-methyl-3- (4-chloro-*o*-tolyl) urea, and 3-(4-chloro- *o*-tolyl)urea. The *N*-(4-chloro-*o*-tolyl) formamidine was formed by sequential N-demethylation of chlordimeform. It was suggested that at least one of the urea metabolites was formed by hydroxylation of the admidine carbon of one of the formamidines, followed by a shift to the keto tautomer. Apparently N-demethylation also was involved. (Author abstract reprinted by permission of the American Chemical Society)

77-2426 Sikka, H. C. ; Appleton, H. T.; Gangstad, E. O. (Life Sci. Div., Syracuse Res. Corp., Syracuse, NY 13210) **Uptake and metabolism of dimethylamine salt of 2,4-dichlorophenoxyacetic acid by fish.** *J. Agric. Food Chem.* 25(5): 1030-1033; 1977. (9 references)

Bluegills and channel catfish removed less than 0.5% of dimethylamine salt of ^{14}C-ring-labeled 2,4-dichlorophenoxyacetic acid (DMA-[^{14}C]-2,4-D) when exposed in aquaria to water containing 2 ppm of the herbicide. The maximum concentration of 2,4-D in the fish was reached within 24 h of treatment; thereafter it did not change significantly up to 7 days. Catfish removed a smaller amount of the herbicide from the water than bluegills. No evidence for bioaccumulation of 2,4-D in the fish was noted during the duration of the experiment. A major portion of the radioactivity absorbed by the fish was associated with the head and viscera portions with relatively low concentrations in the edible flesh. The fish did not metabolize 2,4-D during the 7 days following treatment. Bluegills administered DMA-[^{14}C]-2,4-D by intraperitoneal injection excreted 90% of the herbicide within 6 h of treatment. (Author abstract reprinted by permission of the American Chemical Society)

77-2427 Zulalian, J. ; Blinn, R. C. (Metabolism Lab., Agric. Div., American Cyanamid Co., Princeton, NJ 08540) **Metabolism of cytrolane systemic insecticide (mephosfolan), propylene (diethoxy pnosphinyl) dithioimidocarbonate, in cotton plants.** *J. Agric. Food Chem.* 25(5): 1033-1039; 1977. (15 references)

Cytrolane Systemic Insecticide (mephosfolan), labeled with carbon-14 at the imino carbon atom, was applied foliarly to cotton plants in the greenhouse. After 42 days, 58.2% of the applied dose was recovered from the cotton plants. Most of the radioactivity, 53% of the applied dose, was recovered from the treated leaves while small amounts of radioactivity were recovered from the untreated leaves and the stems (including the petioles and roots), 1.1 and 4.1%, respectively. Of the applied radioactivity that was recovered from the treated leaves, 41.5% was in the ethanol extract and 11.5% was in the plant marc. The major residue that was found on the leaves, 60.9% of the radioactivity in the extract after 42 days (25.3% of the applied dose), was identified as mephosfolan. Thiocyanate ion and the glucose conjugates of (hydroxymethyl) ethylene (diethoxyphosphinyl) dithioimidocarbonate and (hydroxymethyl) vinylene (diethoxyphosphinyl) dithioimidocarbonate were identified as metabolites of mephosfolan. These metabolites accounted for 0.2, 2.1, and 4.6% of the applied dose, respectively. Two additional metabolites were found, accounting for 1.9 and 0.9% of the applied dose, which had two-dimensional TLC properties that were similar to the two metabolites derived from the carbon-14 labeled iminodithiolane intermediate, propylene dithioimidocarbonate hydrochloride. Therefore, these two metabolites may not retain the diethoxyphosphinyl moiety of mephosfolan. (Author abstract reprinted by permission of the American Chemical Society)

77-2428 Hunt, L. M. ; Chamberlain, W. F.; Gilbert, B. N.; Hopkins, D. E.; Gingrich, A. R. (U.S. Livestock Insects Lab., Agric. Res. Serv., U.S. Dep. Agric., Kerrville, TX 78028) **Absorption, excretion, and metabolism of nitrofen by a sheep.** *J. Agric. Food Chem.* 25(5): 1062-1065; 1977. (5 references)

The herbicide nitrofen (2,4-dichlorophenyl 4-nitrophenyl ether) was ^{14}C labeled and administered orally to a sheep at 40 mg/kg. Ninety-nine hours after treatment, 76.2% of the applied dose was accounted for in the excreta. Nitrofen was found in feces and blood, but not in urine. At the 100-h slaughter, radiocarbon levels were highest in fat (23.1-24.1 ppm); the liver, thyroid, and mammary gland had levels of 2-3 ppm; and the adrenal gland, kidney, lung, muscle, skin, and spleen had levels of 1-2 ppm. The most predominant metabolism products were 2,4-dichlorophenyl 4-aminophenyl ether, 2,4-dichloro- 5-hydroxyphenyl 4-nitrodiphenyl ether, 2,4-dichlorophenol, 2-chlorophenyl 4-nitrophenyl ether, and conjugates. No evidence of rearrangement of the chlorines was seen. (Author abstract reprinted by permission of the American Chemical Society)

77-2429 Chae, K. ; Cho, L. K.; McKinney, J. D. (Natl. Inst. Environ. Health Sci., Environ. Biol. Chem. Br., Research Triangle Park, NC 27709) **Synthesis of 1-amino-3,7,8-trichlorodibenzo- *p*-dioxin and 1-amino-2,3,7,8- tetrachlorodibenzo- *p*-dioxin as haptenic compounds.** *J. Agric. Food Chem.* 25(5): 1207-1209; 1977. (12 references)

The chemical syntheses and characterization of 1-amino-3,7,8- trichlorodibenzo- *p*-dioxin and 1-amino- 2,3,7,-8-tetrachlorodibenzo- *p*-dioxin are reported. These compounds can be used to couple with carrier proteins affording antigens for radioimmunoassay methodology. (Author abstract reprinted by permission of the American Chemical Society)

77-2430 Majumdar, S. K. ; Maharam, L. G.; Viglianti, G. A. (Dep. Biol., Lafayette College Easton, PA 18042)

Mutagenicity of dieldrin in the salmonella-microsome test. *J. Hered.* 68(3): 184-185; 1977. (9 references)

The mutagenic activity of dieldrin was examined by the Ames salmonella-microsome method using *Salmonella typhimurium* TA 98 (detects frameshift mutations), TA 100, and TA 1535 (detects base-pair substitution). Addition of dieldrin dissolved in dimethyl sulfoxide to the incubation medium resulted in a significantly greater number of revertant colonies for all strains compared to controls in the presence of the activated mouse liver microsomes. Mutagenicity of dieldrin was not expressed in one strain (TA1535) in the absence of microsomes, and in the other strains the effect was less pronounced than it was with the microsomes.

77-2431 Oliver, J. E. (U.S. Dep. Agric., Res. Agric. Res. Serv., BARC-W, Beltsville, MD 20705) **A synthesis of camphene-8-^{14}C and toxaphene-^{14}C.** *J. Labelled Compd. Radiopharm.* 8(3): 349-352; 1977. (5 references)

An effective method was developed for one-vessel synthesis of small amounts of camphene-8-^{14}C. The method involved reacting methyl-^{14}C-iodide with triphenylphosphine and treating the resulting phosphonium salt with methyllithium to produce methylene(^{14}C)-triphenylphosphorane, which is then condensed with camphenilone to produce camphene-8-^{14}C. Direct chlorination of the labeled camphene produced toxaphene-^{14}C, suitable for metabolic and other studies.

77-2432 Seiler, J. P. (Swiss Fed. Res. Stn., CH-8820 Waedenswil, Switzerland) **Inhibition of testicular DNA synthesis by chemical mutagens and carcinogens. Preliminary results in the validation of a novel short term test.** *Mutat. Res.* 46(4): 305-310; 1977. (14 references)

Measurement of the inhibition of testicular DNA synthesis by chemical carcinogens and mutagens in male mice has been proposed as a screening test (Friedman-Staub assay). A series of experiments was initiated to validate this test system; results obtained with 100 chemicals tested are presented. A first group of chemicals comprised known mutagens and carcinogens, a second group comprised compounds (especially pesticides) which had previously been tested and had failed to display such activity, and a third group comprised some anilines of unknown properties. At least 86% of the compounds previously known as carcinogens and/or mutagens gave positive results in the test, whereas only 10% of the compounds previously determined to be non-carcinogenic and non-mutagenic significantly depressed DNA synthetic activity. Most of the carcinogens and mutagens detected in this test gave negative results in the Ames test. Positive results in this test were obtained with dichlofluanid, which had been previously reported to be free from carcinogenic activity. The explanation and significance of this finding remain to be determined. Large amounts of the chemicals tested must be given to the animals to elicit a response. The test will not detect mutagenic or carcinogenic activity of an impurity within an otherwise inactive compound.

77-2433 Boush, G. M. ; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI) **Pesticide degradation by marine algae.** *Natl. Tech. Inform. Serv.* AD-A008,275, 23 p.; 1975. (3 references)

Various algae species were tested for their susceptibilities towards chlorinated hydrocarbon insecticides. Dieldrin, which is the most frequently found pesticidal contaminant in the US, and its analogs were found to inhibit the growth of certain of alagae species. *Anacystis nidulans* in particular showed marked susceptibility to endrin, dieldrin, ketoendrin and photodieldrin. This species was also susceptible towards dieldrin metabolites such as metabolites F and G. Among DDT metabolites DDD (TDE) was found to be the most toxic material, followed by DDE, DDT and FW-152. It has not been known that DDT should be more toxic to algae. In terms of acute toxicity phenylmercuric acetate was by far the most algicidal agent among all pesticidal chemicals tested. This pesticide is toxic to both *A. nidulans* and *A. quadruplicatum* at the concentration of 1 ppb. (Author abstract by permission)

77-2434 Denson, D. D. ; Manser, G. E.; Piszkiewicz, L. W. (Stanford Res. Inst., Menlo Park, CA) **Reactivity of micellar ketooximes with organophosphorus esters.** *Natl. Tech. Inform. Serv.* AD-A012,754, 63 p.; 1974. (14 references)

The objective of this research is to determine the reaction rates of especially synthesized ketooximes having the ability to form micelles with organophosphorus esters in an attempt to find ketooximes that will react rapidly with G agents. The most applicable and general method to synthesize long-chain RCOCH = NOH compounds includes a multistep synthesis for beta-ketoesters. Saponification to the corresponding acids proceeds in quantitative yields. A sample of the best oxime (C7H15COCH = NOH) was supplied to Edgewood Arsenal where the kinetic data were confirmed. The reaction of N,N-dimethyl-p-phenylenediamine with chloral oxime was investigated extensively. Quaternary salts of p-N,N-dimethylaminoisonitrosoacetanilide were prepared and evaluated. Octanoyl cyanide was prepared to evaluate the effect of an acyl cyanide on the auto-decomposition of aliphatic alpha-ketoaldoximes. Kinetic measurements were made for the reaction of various oximes with DFP by monitoring production of cyanide ion. Micellar catalysis was found for one long chain alpha-ketoaldoxime when incorporated into micelles of a long alkyl chain ammonium-substituted isonitrosoacetanilide. (Author abstract by permission)

77-2435 Wolverton, B. C. (Natl. Space Technol. Labs., NASA, Bay St. Louis, MS) **Aquatic plants for removal of mevinphos from the aquatic environment.** *Natl. Tech. Inform. Serv.* N75-16026, 8p.; 1975. (6 references)

Fragrant waterlily (*Nymphaea odorata*, Ait.), jointgrass (*Paspalum distichum* L.), and rush (*Juncus repens*, Michnx.) were used to evaluate the effectiveness of vascular aquatic plants in removing the insecticide mevinphos (dimethyl- 1-carbomethoxy- 1-propen-2-yl phosphate) from wa-

ters contaminated with this chemical. The emersed aquatic plants fragrant waterlily and joint-grass removed 87 and 93 ppm of mevinphos from water test systems in less than 2 weeks without apparent damage to the plants; whereas rush, a submersed plant, removed less insecticide than the water-soil controls. Water-soil control still contained toxic levels of this insecticide, as demonstrated by fish bioassay studies, after 35 days. (Author abstract by permission)

77-2436 Burchfiel, J. L. ; Duffy, F. H.; Sim, V. M. (Edgewood Arsenal, Aberdeen Proving Ground, MD) **Persistent effects of sarin and dieldrin upon the primate electroencephalogram.** *Natl. Tech. Inform. Serv.* AD-A009, 494, 23 p.; 1975. (34 references)

Rhesus monkeys were administered sarin or dieldrin in either a single large dose (5 micrograms/kg sarin or 4 mg/kg dieldrin i.v.) or multiple smaller doses (a series of 10 i.m. injections of 1 micrograms/kg sarin or 1 mg/kg dieldrin at intervals 1 week apart). Animals receiving the single, large doses showed symptoms of acute poisoning including prolonged electrical seizure activity. Animals receiving the multiple doses did not show these signs of acute toxicity. Electroencephalograms (EEG's) were recorded before exposure and at 24 hours and 1 year after exposure. EEG data were computer-processed to yield frequency spectra, and statistical analyses were performed over standard EEG frequency bands. For both drugs and both dose schedules, there was a significant increase in the relative amount of beta energy in the frontal-central and occipital-temporal cortical EEG which persisted for a year. (Author abstract by permission)

77-2437 Paris, D. F. ; Lewis, D. L.; Barnett, J. T., Jr.; Baughman, G. L. (Southeast Environ. Res. Lab., Environ. Protect. Ag., Athens, GA) **Microbial degradation and accumulation of pesticides in aquatic systems.** *Natl. Tech. Inform. Serv.* PB-241,293, 54 p.; 1975.

The microbial degradation and sorption of carbaryl, malathion, butoxyethyl ester of 2,4-dichlorophenoxyacetic acid (2,4-DBE), methoxychlor, atrazine, diazinon, captan, parathion, and toxaphene were investigated. Malathion and 2,4-DBE were found to undergo transformation readily in both bacterial and fungal cultures. Degradation of malathion and 2,4-DBE at low concentrations (< 1mg/l) in batch cultures of bacteria followed second-order kinetics as predicted by the Michaelis-Menten theory. A single isomer, beta-monoacid of malathion, was the primary metabolite in transformation of malathion by both bacterial and fungal populations. The major metabolite found in 2,4-DBE studies was 2,4-D. Carbaryl underwent chemical hydrolysis to alpha-naphthol in both heterogeneous bacterial cultures and uninoculated controls. In the cultures alpha-naphthol was metabolized to 1,4-naphthoquinone and two unidentified compounds. Bacterial degradation of malathion or 2,4-DBE. The insecticide was metabolized to methoxychlor-DDE. Rapid and extensive sorption of pesticides to fungi, bacteria, and algae was observed with methoxychlor and toxaphene, but with any of the other pesticides investigated. (Author abstract by permission)

77-2438 Bunting, D. L. ; Robertson, E. B., Jr. (Water Resour. Res. Ctr., Tennessee Univ., Knoxville, TN) **Lethal and sublethal effects of herbicides on zooplankton species.** *Natl. Tech. Inform. Serv.* PB-241,337, 42 p.; 1975.

Nauplii, 0-4 hours old, of the copepod *Cyclops vernalis* were exposed to concentration ranges of amitrole, amitrole-T, and the free acid and alkanolamine salt of 2,4-D. LD50, LT50, and incipient lethal levels were calculated and discussed. Third and fourth instar larvae of *Chaoborus punctipennis*, a planktonic dipteran, were subjected to static tests of the commercial herbicides containing 2,4-D, ammonium sulfamate, and amitrole. Fifty percent responses were calculated for each herbicide, and an emergence-suppression threshold was noted for amitrole. Data were obtained for three rotifers, *Kepatella cochlearis, K. americana,* and *Brachionus angularis,* relative to the acute toxicity of six water soluble or water emulsifiable forms of 2,4,5-T. Technical 2,4,-5-T was also assayed against *K. cochlearis.* Data on the effects of food level on LT50, and food level, dose, and exposure time on LC50 were given. The effects of temperature, exposure time, and concentration of aminotriazole on *Daphnia pulex* females and males were measured. LT50 data were presented along with a discussion of sublethal effects and information from preliminary tests using forms of 2,4-D and 2,4,5-T. (Author abstract by permission)

77-2439 Mantel, N. (George Washington Univ., Washington, DC) **Estimating limiting risk levels from orally ingested DDT and dieldrin using an up-dated version of the Mantel-Bryan procedure.** *Natl. Tech. Inform. Serv.* PB-243,009, 38p.; 1974.

Mathematical extrapolations of the upper limits on risk of cancer at various low levels of exposure to dieldrin and DDT are presented. The statistical model used is that described by Mantel, et al., Cancer Research, 35, 865-872, 1975, the so-called 'updated' Mantel-Bryan procedure. The data upon which the extrapolations are based are derived from the studies by Tomatis, et al., International Journal of Cancer, 10, 489-506, 1972 for DDT and by Walker, et al. Food and Cosmetics Toxicology, 11, 415-432, 1972 for dieldrin. Several alternative methods of treating the data are presented, and pesticide levels associated with various levels of risk are estimated. Certain precautions which must be observed in applying the 'updated' Mantel-Bryan technique are discussed. (Author abstract by permission)

77-2440 Midwest Res. Inst. (Kansas City, MO) **Substitute chemical program: Initial scientific and minieconomic review of crotoxyphos (Ciodrin).** *Natl. Tech. Inform. Serv.* PB-244,568, 107 p.; 1975.

The report on crotoxphos, a registered substitute chemical for certain cancelled and suspended uses of DDT, covers all uses of crotoxyphos and is intended to be adaptable to future needs. Should crotoxphos be identified as a substitute for a problem pesticide other than DDT, the review can be updated and made readily available for use. The substitute chemical is reviewed for suitability considering all applicable

scientific factors such as: chemistry, toxicology, pharmacology and environmental fate and movement; and socio-economic factors such as: use patterns and costs and benefits. (Author abstract by permission)

77-2441 Konno, N. ; Kinebuchi, H.; Yamauchi, T. (Sch. Publ. Health, Fukushima Prefect. Med. Coll., Fukushima, Japan) **Persistence of an organophosphorus pesticide, leptophos (phosvel) in adipose tissue of hens.** *Nippon Koshu Eisei Zasshi (Jpn. J. Publ. Health)* 24(8): 507-512; 1977. (15 references) (Japanese)

On days 1, 3, 7, 14, 21 and 28 after a single oral administration of leptophos (phosvel), *O*-(4-bromo-2,5-dichlorophenyl), *O*-methyl phenylphosphonothioate, to each of 18 adult hens (white leghorn) at a dose rate of 250 mg/kg, 3 hens each were sacrificed and intraperitoneal adipose tissue samples were collected. Prior to sacrifice any nervous impairment was observed. The amount of leptophos in the adipose tissue was determined by extracting with petroleum ether, then partitioning twice with hexane and acetonitrile, followed by cleanup and column chromatography. The residual concentration of leptophos in the adipose tissue was 35.0, 12.0, 2.98, 0.07 and 0.09 ppm, respectively, at 1, 3, 7, 14 and 21 days after the administration. In the tissue collected 28 days after administration, no leptophos was detected. The biological half life of leptophos in the adipose tissue calculated from the present data up to 7 days after administration was 1.4 days. Conspicuous body weight loss was not observed in the hens 14 days after administration, and no motor disturbance such as disturbance of gait was observed in the hens.

77-2442 Hennighausen, G. ; Tiefenbach, B.; Lohs, K. (Inst. Pharmakol. Toxikol., Wilhelm-Pieck Univ. Rostock, Rostock, DDR) **Der Einfluss von 2-Chloraethylphosphonsaeure (Ethephon) auf die Aktivitaet von Cholinesterasen in vivo and in vitro in Beziehung zur akuten Toxizitaet. [The effect of ethephon on cholinesterase activity in vivo and in vitro in relatin to acute toxicity.]** *Pharmazie* 32(3): 181-182; 1977. (7 references) (German)

Ethephon performs its function as a plant growth regulator by releasing ethylene; it is able to phosphorylate alcohols and phenols. Therefore its cholinesterase inhibiting property was examined, as was the question of the involvement of acidic corrosion in toxic effects. Ethephon produces prolonged inhibition of plasma ChE in vivo after oral administration of toxic doses to rats and mice, but does not inhibit erythrocyte and brain ChE. Even small doses of ethephon (e.g., 250 mg/kg, compared to an LD50 of 2850 mg/kg) inhibited cholinesterase by 96%; 10 mg/kg inhibited plasma ChE activity by 40%. Under in vitro conditions all of the ChE types investigated (from plasma, erythrocytes, and brain of rats and mice) were inhibited by ethephon at ca. 30-500 μg. Ethephon apparently breaks down before reaching sensitive tissue sites. The acute toxic action of ethephon is not inhibited by atropine. Acid corrosive effects were demonstrated as the cause of death in acute intoxications of rats and mice with ethephon.

77-2443 Hsia, M. T. S. ; Bairstow, F. V. Z.; Shih, L. C. T.; Pounds, J. G.; Allen, J. R. (Dep. Pathol., Med. Sch. Univ. Wisconsin, Madison, WI) **3,4,3′,4′-tetrachloroazobenzene: a potential environmental toxicant,** *Res. Commun. Chem. Pathol. Pharmacol.* 17(2): 225-236; 1977. (14 references)

TCAB (3,4,3′,4′-tetrachloroazobenzene) is a potential environmental toxicant which forms during the industrial manufacture and microbial degradation of industrial herbicides. This compound was prepared in 87% yield using an improved procedure. Mammalian cell toxicity was observed in experiments in vitro with C3H/10T1/2 cells, and may be correlated with observable cytologic changes. The *Salmonella*/microsome test revealed weak mutagenic activity for TCAB. Cultures of C3H/10T1/2 cells placed in contact with TCAB for ten days showed focal morphologic alterations characteristic of transformed cells. Numerous type III foci were observed; such foci have previously been shown to produce tumors when injected into syngeneic C3H mice. The data suggest a potential health hazard associated with environmental occurrence of TCAB.

77-2444 Szczepaniak, S. ; Jeleniewicz, K.; Sienkiewicz, E.; Ochynski, J.; Podolak, M. (Dep. Chem. Toxicol., Inst. Anal. Technol., Pharm., Acad. Med., Lublin, Poland) **Bialko calkowite, wspolczynnik a/g i azot alfa-aminowy w surowicy krwi szczurow po jednorazowym zatruciu chlorfenwinfosem i karbarylem w dawce 1/2 LD50. [Total protein, A/G ratio and alpha-amino nitrogen in serium in rats after single-dose poisoning with chlorfenvinphos and carbaryl at 1/2 LD50.]** *Roczn. Panstw. Zakl. Hig.* 28(1): 79-84; 1977. (13 references) (Polish)

Total protein levels albumin/globulin ratio, and alpha-amino nitrogen levels in rat serum were examined at 2, 4, 24, and 72 hr after administration of chlorfenvinphos at 6.5 mg/kg or carbaryl at 474 mg/kg. The serum total protein concentration was elevated at 2 and 4 hr after chlorfenvionphos poisoning and at 2, 4, and 24 hr after carbaryl poisoning. The alpha-amino nitrogen level was lower following administration of both of these poisons than in the control group after 2 and 4 hr. No changes were observed in the A/G ratio. The decrease in alpha-amino nitrogen level was greater after carbaryl than after chlorfenvinphos.

77-2445 Ochynski, J. (Dep. Chem. Toxicol., Inst. Anal. Technol. Pharm., Acad. Med., Lublin, Poland) **Wplyw bromfenwinfosu na niektore odczyny histochemiczne watroby i zoladka szczura. [Effects of bromfenvinphos of some histochemical reactions in rat liver and stomach.]** *Roczn. Panstw. Zakl. Hig.* 28(1): 85-91; 1977. (9 references) (Polish)

Bromfenvinphos in oil was administered intragastrically to rats (5 groups of 6 each) in a single dose of 1/2 LD50 or at 1/5 or 1/10 LD50 per day for 1.2 and 3 mo. The liver and stomach were then examined macroscopically and by histological reactions for RNA, glycogen (PAS), alkaline phosphatase, and acid phosphatase. A significant decrease in the intensity of reactions for RNA, reduced glycogen content, and increased activity of both phosphatases were observed in

the livers of animals of the two highest dose groups. The most extensive changes in the stomach were also observed in these groups, and mainly comprised a rise in acid phosphatase activity and decreased mucus secretion by mucocytes.

77-2446 Urbanek-Karlowska, B. (Dep. Anal. Food Commod., Natl. Inst. Hyg., Warsaw, Poland) **Wplyw niedoborow bialkowych u szczurow na toksycznosc kaptanu. Cz. II. Aktywnosc Wybranych enzymow w surowicy krwi i watrobie szczura w zaleznosci od poziomu bialka i kaptanu w diecie. [Effect of protein deficiency in rats on captan toxicity. Part II. The activity of selected enzymes in rat serum and liver depending on the dietary level of protein and captan.]** *Roczn. Panstw. Zakl. Hig.* 28(2): 121-132; 1977. (11 references) (Polish)

The effect of captan administration in the presence of dietary protein deficiency was investigated on the activities of certain enzymes in serum and liver homogenate. The enzymes included aspartate aminotransferase, alanine aminotransferase, fructosediphosphate aldolase, and glucosephosphate isomerase. Rats were maintained on this treatment for 12 wk. The protein contents of the diet were 24, 8, or 4%, and the captan level in the diet was 0.01 or 0.1%. Captan toxicity in the 12-week experiment was increased in the animals kept on protein-deficient diets. The aminotransferase activities were altered, primarily as a result of protein deficiency. The fructose diphosphate aldolase activity changed significantly as a function of both protein deficiency and captan levels.

77-2447 Zawadzka, T. (Dep. Anal. Foods Commodities, Natl. Inst. Hyg., Warsaw, Poland) **Wplyw wybranych pestycydow na aktywnosc dehydtratazy weglanowej in vitro. Cz. I. Badanie dzialania cynkotoxu, cynkomiedzianu, miedzianu i luxan manebu 80 na aktywnosc wolowej dehydratazy weglanowej. [Effect of selected pesticides on the activity of carbonic anhydrase in vitro. Part 1. Studies on the effects of Cynkotox, Cynkomiedzian, Miedzian, and Luxan Maneb 80.]** *Roczn. Panstw. Zakl. Hig.* 28(2): 141-147; 1977. (20 references) (Polish)

Cynoktox (65% zineb), Cynkomiedzian (32% zineb plus 12% copper oxychloride), Miedzian (50% copper oxychloride), and Luxan Maneb 80 (80% maneb) are commonly used in Poland. The effects of these compounds on carbonic anhydrase were examined using an enzyme system isolated from bovine erythrocytes. The results were evaluated by analysis of variance with linear regression. The inhibition of carbonic anhydrase activity by the pesticides examined showed a linear regression over the concentration range investigated. The correlation coefficients for Cynkotox, Cynkomiedzian, Miedzian, and Luxan Maneb 80 respectively were 0.8930, 0.9265, 0.8816, and 0.9736. Luxan Maneb 80 was the strongest inhibitor of carbonic anhydrase. It inhibited the carbonic anhydrase activity by 75% at a concentration of 0.245 μM, whereas the other pesticides caused a similar inhibition at concentrations of about 10 μM.

77-2448 Urbanek-Karlowska, B. (Dep. Food Commod. Anal. Natl. Inst. Hyg., Warsaw, Poland) **Aktywnosc enzymow mikrosomalnych watroby szczura w zaleznosci od pozoimu bialka w diecie i podawania wybranych pestycydow. [The activity of microsomal enzymes of rat liver in relation to dietary protein level and administration of selected pesticides.]** *Roczn Panstw. Zakl. Hig.* 28(3): 243-251; 1977. (Polish)

Aminopyrine demethylase and *p*-nitroanisole demethylase activities were examined in livers of rats maintained for 12 wk on a semisynthetic diet containing 24%, 8%, or 4% protein. Diets in some groups also contained 0.1% captan, 0.5% folpet, and 0.05% captafol. Activities of the enzymes examined were decreased in the rats on the low-protein diet (4%) compared to the controls (24% protein diet). The fungicides at the levels tested were weak inducers of both demethylases. Captan had the strongest enzyme inducing activity.

77-2449 Zawadzka, T. (Dep. Anal. Food Commod., Natl. Inst. Hyg., Warsaw, Poland) **Wyplyw wybranych pestycydow na aktywnosc dehydratazy weglanowej in vitro. Cz. II. Dzialanie niektorych metabolitow preparatow zinebu i manebu na aktywnosc wolowej dehydratazy weglanowej. [The effect of selected pesticides on the activity of carbonic anhydrase in vitro. Part II. The action of certain metabolites of zineb and maneb preparations on the activity of bovine carbonic anhydrase.]** *Roczn Panstw. Zakl. Hig.* 28(3): 253-257; 1977. (Polish)

In attempts to elucidate the action mechanism of dithiocarbamate fungicides the effects of sodium ethylene bisdithiocarbamate, ethylenethiourea, ethylenediamine, carbon disulfide, and zinc, copper, and manganese ions was examined on the activity of carbonic anhydrase isolated from bovine erythrocytes. Sodium ethylene bisdithiocarbamate, carbon disulfide, and copper ions at 4 μg/ml added to the enzyme solution significantly inhibited carbonic anhydrase activity. All of the compounds except ethylenediamine inactivated carbonic anhydrase when added to the solution at 20 μg/ml.

77-2450 Senczuk, W. ; Mlynarczyk, W.; Szopski, W. (Dep. Chem. Toxicol., Inst. Chem. Anal., Akad. Med., Poznan, Poland) **Zmiany ilosciowe tyrozyny w eksperymentalnych zatruciach ferbamem 76. Cz. II. Zawartosc wolnej tyrozny w moczu zwierzat doswiadczalnych. [Quantitative changes of tyrosine in experimental intoxication with ferbam 76. Part II. Free tyrosine content in the urine of experimental animals.]** *Rocz. Panstw. Zakl. Hig.* 28(3): 281-289; 1977. (Polish)

Ferbam 76% was administered orally to rats in single doses of 80, 100, 400, and 800 mg/kg; studies were also performed after multiple administration of this preparation. The free tyrosine content was determined in 24-hour urine samples from the treated rats. A linear relationship was found between the ferbam dose administered and the tyrosine level in the urine. Based on the tyrosine levels in urine of animals

repeatedly given ferbam, on the calculated LD50, and on the cumulation coefficient, this fungicide was judged to be of high biological activity and high toxicity.

77-2451 Engst, R. ; Baron, R.; Crosby, D. W.; Drescher, N.; Engst. R.; Greenhalgh, R.; Kearney, P. C.*; Korte, F. (Building 050, BARC-West, Beltsville, MD 20705) **Ethylenethiourea.** *Pure Appl. Chem.* 49(5): 675-689; 1977. (50 references)

Toxicologic studies reviewed have demonstrated that ethylenethiourea (ETU) has goitrogenic, tumorigenic, and teratogenic effects in laboratory animals. ETU is a manufacturing, processing, and metabolic product of ethylenebisdithiocarbamate fungicides, and thus might be encountered on agricultural commodities. Methods of detecting ETU include thin-layer chromatography, polarography, and radioisotope methods, but electron capture or flame photometric gas-liquid chromatography (with derivatization) is preferred. ETU is degraded by oxidative reactions in biological systems and by photolytic reactions. ETU degradation products detected in plants and soil include 2-imidazolinone, 2-imidazoline, hydantoin, and Jaffe's base. In animal urine ethyleneurea, oxalic acid, glycine, and urea have been detected. ETU has been detected at less than 0.1 ppm in treated crops, primarily as surface residues.

77-2452 Graham-Bryce, I. J. (Rothamsted Exp. Stn., Harpenden, Herts, England, AL5 2JQ) **Insecticides and Fungicides Department.** *Rothamsted Report for 1976, Part I, 159-189;* 1976. (30 references)

Studies discussed in this report were directed toward establishing more clearly the implications of the recent advances which led to these compounds in terms of relationships between structure and activity. The report includes information on the following topics: relationship between molecular structure and insecticidal activity of pyrethroids, the neurotoxicity of pyrethroids, neuroanatomy of the insect central nervous system, survey of resistance in *Myzus persicae* , relationships between the presence of resistance and effectiveness of control sprays, the effects of inhibitors on response of susceptible and resistant houseflies to insecticides, organophosphorus-resistant acetylcholinesterase in houseflies and cattle ticks, side effects of pesticides on beneficial insects such as honeybees, seed treatments, control of slugs in cereals, chemicals influencing insect behavior, equipment and techniques important in the area of pest control, fungicides, and information on the chemical liaison unit.

77-2453 Murakami, M. ; Fukami, J. (Inst. Phys. Chem. Res., Wako, Saitama, Japan) **Utilization of human cultured cells for evaluating the persistence of pesticides and environmental chemicals.** *Seikagaku (Biochemistry)* 49(8): 795; 1977. (2 references) (Japanese)

Uptake of DDT, dieldrin, aldrin, PCB, hexachlorobenzene, malathion, parathion, 2,4-D, 2,4,5-T, chlordimeform and carbaryl into human fetal diploid cells (Hel 299) was studied in a culture medium containing these pesticides and environmental chemicals (all ^{14}C-labeled). After determining the amount taken up by the liquid scintillation method, it was found that the substances which had been reported to persist extensively in adipose tissues of living organisms such as DDT, dieldrin, aldrin, PCB, and hexachlorobenzene were more extensively taken up by the cells than those which had been thought not to be persistent, such as malathion, parathion, 2,4-D, 2,4,5-T, and chlordimeform. Carbaryl assumed a position intermediate between the two groups. (Abstract of lecture, in 50th Ann. Meeting of Jap. Soc. Biochem.)

77-2454 Luton, J. P. ; Ghnassia, J. P.; Bricaire, H. (Cent. Rech. Endocrinol., Hop. Cochin, Paris Cedex 14, France) **Traitements medicaux en maladies de Cushing. [Medical treatment in Cushing's disease.]** *Sem. Hop. (Paris)* 53(24): 1476-1479; 1977. (8 references) (French)

In recent years surgery has been the preferred treatment for Cushing's disease. Radiotherapy may be used in the case of pituitary tumors appearing after total adrenalectomy, or in conjunction with hypophysectomy. Drugs with various targets have been proposed for use; they primarily act on the adrenals or on the hypothalamic-pituitary axis. The four drugs chiefly used at present are *o,p'*-DDD (TDE), aminoglutethimide, cyproheptadine hydrochloride, and bromoergocryptine. The method of choice at present, especially in cases of pure adrenal hyperplasia, is *o,p'*-DDD, administered at 10-12 g/day until adrenal insufficiency develops then at 8-10 g per day for about 6 mo.

77-2455 Niijima, K. ; Yasuda, Y.; Fukushima, M.; Miyata, M.; Ishikawa, S. (Sch. Ophthal., Fac. Med., Kitasato Univ., Sagamihara, Kanagawa, Japan) **[Neurotoxicological studies on 1-naphthyl *N*-methylcarbamate (carbaryl) centered on its biochemical properties.]** *Shinkei Kenkyu No Shimpo (Adv. Neurol.)* 21(3): 626-635; 1977. (20 references) (Japanese)

In order to evaluate the neurotoxicologic effect of carbaryl, its acute and subacute oral toxicity (150 mg/kg in a single dose in acute experiments and 1.5-6 mg/kg/week for 24 weeks in subacute experiments) was determined according to its residues in Wistar rats, and its inhibitory efficacy against AChE in cervical and thoracic spinal cord. In the acute tests about 98% of the administered carbaryl disappeared from the rat blood after 48 hr. Inhibition of AChE in the cervical and thoracic portions of the spinal cord amounted on 60-70% on the first day; however, recovery of over 70% was seen on the third day. The inhibition in cerebral cortex, caudate nucleus, and brainstem varied randomly. However, 45-65% inhibition was observed for 3 days, without remarkable inhibition in the cerebellum. BuChE in the retina was obviously inhibited but, AChE was not. After subacute administration AChE in spinal cord and cerebral cortex was inhibited for the full 24 weeks. The ocular fundus revealed constricted vessels with congestion of choroidal vessels, accompanied by severe narrowing of the vessels at 24

weeks. After studying the physiological function of equilibrium it was found that there was obvious loss of balance in treated animals as compared to that of controls ($P < 0.05$). It was concluded that carbaryl affects the general nervous system including the retina by way of cholinesterase inhibition, probably resulting in delayed neurotoxicity in the chronic stage.

77-2456 Diz, K. M. ; Van Der Pauw, C. L.; McCarthy, W. V. (Shell. Res. Ltd., Tunstall Lab., Sittingbourne Res. Ctr., Sittingbourne, Kent, England) **Toxicity studies with dieldrin: teratological studies in mice dose orally with HEOD.** *Teratology* 16(1): 57-62; 1977. (11 references)

Doses of 1.5 and 4.0 mg/kg/day of HEOD in corn oil and 0.25, 0.5 and 1.0 mg/kg/day of HEOD in dimethyl sulphoxide (DMSO) were administered to pregnant CF1 mice on days 6 to 14 (inclusive) of gestation. Some maternal and fetal toxicity was seen in the HEOD in DMSO and DMSO control groups compared with the untreated controls, such as reduced body weight gains, some maternal deaths, lower fetal body weights and increased incidence of delayed ossification of the foetal bones. No maternal or fetal toxicity was seen in the HEOD in corn oil or the corn oil control groups. No compound-related teratogenic effects were observed. (Author abstract by permission)

77-2457 Ohmiya, Y. ; Nakai, K. (Dep. Pharmacol., Akita Univ. Sch. Med., Akita, Japan) **Effect of starvation on excretion, distribution and metabolism of DDT in mice.** *Tohoku J. Exp. Med.* 122(2): 143-153; 1977. (20 references)

Tissue radioactivity levels resulting from a single injection of ^{14}C-DDT were examined 8 days after the injection in mice which were also subjected to starvation. The animals were fasted and given barium sulfate by stomach tube for the last three days of the test period. Starved animals lost weight; the weights of their epididymal fat and liver decreased, and whole-body as well as epididymal fat lipid contents decreased. DDT levels became markedly elevated in tissues other than muscle, and neurotoxic signs (tremors and convulsions) were sometimes seen. Starvation did not alter excretion of DDT-related metabolites. TLC-radiographic analysis of ^{14}C-DDT metabolic products revealed no significant alteration of the metabolic pattern of DDT-related compounds in tissues and excreta of starved mice.

77-2458 Evans, H. L. ; Garman, R. H.; Weiss, B. (Environ. Health Sci. Cent., Dep. Radiat. Biol. Biophys., Div. Lab Anim. Med., Sch. Med. Dent., Univ. Rochester, Rochester, NY 14642) **Methylmercury: exposure duration and regional distribution as determinants of neurotoxicity in nonhuman primates.** *Toxicol. Appl. Pharmacol.* 41(1): 15-33; 1977. (33 references)

Exposure duration appears to be an important determinant, along with dosage, blood, and brain Hg concentration, of sublethal methylmercury toxicity in macaque and squirrel monkeys. Animals were evaluated for objective neural signs while maintained with blood and brain Hg near equilibrium. Chronic methylmercury, po, produced similar bodily distributions of Hg and neural signs for both species. The characteristic brain regional distribution of Hg is established well in advance of signs, emphasizing the importance of exposure duration and arguing against a major redistribution of Hg as the critical event preceding toxic signs. The calcarine cortex, lateral geniculate, and corpus striatum are candidates for critical brain regions. When near equilibrium, the primate brain Hg concentration is 1.8 to 4.9 times that of whole blood, depending upon region; higher brain/blood ratios are obtained 1 week or more following the end of exposure. Clearance of Hg from most regions of the macaque brain appeared to be similar to the rate of clearance from whole blood ($t1/2 = 21$ days) and thus is considerably shorter than half-time reported for primate hair and whole body. The latent period preceding neural signs was inversely related to whole blood Hg concentration within the range associated with neurological signs in humans (0.5-4.5 ppm). Evidence of a "no-effect" dose in the primate will require lower level exposures in excess of 1000 days. This experimental model can suggest critical indices of human long-term, low-level exposures and it provides a basis for evaluating results from nonprimate species. (Author abstract by permission)

77-2459 Stitcher, D. L. ; Harris, L. W.; Moore, R. D.; Heyl, W. C. (Biomed. Lab., Edgewood Arsenal, Aberdeen Proving Ground, MD 21010) **Synthesis of cholinesterase following poisoning with irreversible anticholinesterases: effects of theophylline and N^6,O^2-dibutyryl adenosine 3′,5′-monophosphate on synthesis and survival.** *Toxicol. Appl. Pharmacol.* 41(1): 79-90; 1977. (35 references)

The half-time (t1/2) for return of whole blood cholinesterase (ChE) activity in mice following poisoning with Soman and DFP is on the order of 30 hr; in rats, the t1/2 for return of whole blood ChE is 32 hr for Soman and 106 hr for DFP. In fact, the recovery of ChE activity in other rat tissues (liver and brain) is also significantly ($p < 0.001$) slower after DFP poisoning than after Soman poisoning. It appears that DFP adversely affects the normal rats for synthesis of ChE in rats; DFP does not affect overall protein synthesis in the rat as measured by ^{14}C-amino acid incorporation into protein. Pretreatment of mice with a combination of theophylline-DBcAMP before poisoning with Soman causes animals to be more sensitive to the poison. Treatment of mice and rats with theophylline-DBcAMP at 24, 29, and 45 hr after Soman poisoning produces a dramatic increase in whole blood ChE but not in brain ChE at 48 hr; this increase in enzyme activity is due to pseudo-ChE and not acetyl-ChE. Ethionine, injected 1 hr before the initial dose of theophylline-DBcAMP, completely abolished the enhanced ChE activity observed in whole blood. These results suggest that the enhanced ChE activity observed in blood is due to a stimulating effect of the drugs on *de novo* synthesis and/or a release of ChE by the liver. (Author abstract by permission)

77-2460 Gerstner, H. G.; Huff, J. E.; Ulrikson, U.; Kissman, H. M.; Vasta, B. M. (Oak Ridge Natl. Lab., Oak Ridge, TN) **Information analysis: the Toxicology Information Response**

Center activities during 1976. *Toxicol. Appl. Pharmacol.* 41(1): 134; 1977.

The Toxicology Information Response Center (TIRC) was founded in the fall of 1971 at the Oak Ridge National Laboratory as a national and international center for toxicology information. Sponsored by the National Library of Medicine's Toxicology Information Program, TIRC is part of the information Center Complex, a major scientific and technical unit within the Information Division of the Oak Ridge National Laboratory. The complex coordinates the functions and activities of several information units at the Laboratory. TIRC selects, evaluates, and synthesizes comprehensive literature packages according to a user's specific request or to satisfy current needs (chlordecone, mirex, vinyl chloride, trichloroethylene). (Author abstract by permission, abridged)

77-2461 Ross, J. H. ; Krieger, R. I. (Dep. Environ. Toxicol., Univ. California, Davis, CA) **Structure-activity relationships of active uptake of paraquat into rat lung as influenced by 4,4′-bipyridyls.** *Toxicol. Appl. Pharmacol.* 41(1): 134-135; 1977.

Paraquat is a widely used, nonselective herbicide whose ingestion causes severe lung lesions in many animals, including man. The compound is reported to be taken up in the lung by an active transprot mechanism capable of producing 10:1 (lung:plasma) concentrations. Tissues such as liver, kidney, and brain did not concentrate paraquat to any great extent. Using the rat lung-slice uptake method developed by Rose et al. (*Biochem. Pharmacol.* 25, 419, 1976), we attempted to find a compound capable of inhibiting (i.e., competitively) paraquat uptake. Among the compounds tested were homologs of paraquat in the 4,4′-bipyridyl series. Measured decreases in rate of [$^{14}CH_3$]paraquat uptake were used to determine the percentage inhibition. Test compounds were added at 0, 10^{-5}, 10^{-4}, and 10^{-3} M concentrations. The concentration of paraquat used in uptake studies was 10 μM, which approximates paraquat concentrations in rat plasma for 15 hr following an oral dose of 126 mg/kg. Inhibitory 4,4′-bipyridyls are those with at least one quaternary nitrogen or the potential for generating one by ionization in aqueous medium at pH 7.4. The relative order of inhibitory potency for the 4,4′-bipyridyls in the series thus far tested are: bipiperidine (reduced 4,4′-bipyridyl) 4,4′-dimethyl 4,4′-diethyl > 4-methyl 4,4′-dipropyl > 4,4′-dibenzyl >> parent compound (4,4′-bipyridyl). This study suggests that increasing chain length on the nitrogen of the 4,4′-bipyridyls decreases ability to block paraquat uptake. (Author abstract by permission)

77-2462 Staples, R. E. ; Goulding, E. H. (Environ. Toxicol. Branch, Natl. Inst. Environ. Health Sci., Research Triangle Park, NC) **Dipterex teratogenicity in the rat, hamster, and mouse when given by gavage.** *Toxicol. Appl. Pharmacol.* 41(1): 137; 1977.

Previous study in this laboratory showed that Dipterex (trichlorfon), an extensively used pesticide, was teratogenic when added to the diet of rats but not when administered by gavage once daily for the same period of gestation. This study was undertaken to determine whether the teratogenic potential of Dipterex could be detected by gavage through administration three times daily rather than once daily to the rat and through three times daily administration to additional species. Dipterex was found to be teratogenic in the rat if given three times daily at 480 mg/kg/day from Days 6 through 15 of gestation but not if given only on Days 8 or 10 of gestation. The malformations occurred in all of the 19 liters exposed to Dipterex (an average of 76.4% of fetuses in each liter was malformed) and consisted mostly of generalized edema, various types of herniation of the brain and cerebrospinal fluid through the skull, micrognathia, severely shortened radius and ulna, hypophalangism, syndactyly, fusions of ribs and sternebrae, and lematomas. A similar positive teratogenic response also occurred in the hamster after administration of Dipterex from Days 7 through 11 of gestation at 400 mg/kg/day; the apparent "no effect" level for the criteria studied was 200 mg/kg/day. Embryotoxicity, but not teratogenicity, occurred after 400 mg/kg/day given on Day 8 of gestation. In both species, the teratogenicity seen was not merely due to reduced maternal food consumption. The mouse was less susceptible to Dipterex than were the rat and hamster, but a significant increase in the incidence of cleft palates resulted from exposure on Days 10 through 14 or on Days 12 through 14 of gestation. (Author abstract by permission)

77-2463 Liddle, J. A. ; Smrek, A. L.; Adams, S. R.; Kimbrough, R. D. (Cent. Dis. Control, Atlanta, GA) **Pharmacodynamics of mirex in goats: effect of reproduction and lactation.** *Toxicol. Appl. Pharmacol.* 41(1): 138; 1977.

Groups of five male and five female goats were given 0 or 1 mg of Mirex/kg daily for 61 weeks. An additional group of female goats were given 1 mg/kg daily for 18 weeks. Both groups of female goats were given daily doses of 10 mg/kg for 4 weeks after the respective exposures to 1 mg/kg for 61 and 18 weeks. The goats exposed for 61 weeks were bred twice and those exposed for 18 weeks were bred once. Adipose tissue concentrations of Mirex were lower in female than in male goats and were not noticeably affected by pregnancy. A steady Mirex concentration was not reached in adipose tissue, whereas the plasma concentrations became stationary after several months of exposure. The concentration of Mirex in milk fat was highest in the immediate postpartum period and then declined in spite of continued dosing. The dose of 1 mg/kg of Mirex did not affect reproduction. (Author abstract by permission, abridged)

77-2464 Smith, L. L. ; Rose, M. S. (Imperial Chem. Ind., Ltd. Cent. Toxicol. Lab., Biochem. Mech. Unit., Aderley Park, Nr. Macclesfield, Cheshire, England) **The toxicity of paraquat in mature and immature rats.** *Toxicol. Appl. Pharmacol.* 41(1): 141-142; 1977.

It has previously been shown that the lungs of immature rats are more resistant to the toxic effects of paraquat than the lungs of mature rats. It is also known that the lungs of immature rats are more resistant to the toxic effects of high concentrations of oxygen. These two observations have contributed to the suggestion that the two phenomena are related and hence that the mechanism of oxygen and paraquat toxicity may be similar. We have confirmed that immature, male rats (50 g) are considerably more resistant to paraquat dosed orally (680 μmol/kg) than mature, male rats (180 g). We

have investigated this further by comparing plasma and lung concentrations of paraquat after dosing. The concentration of paraquat in the plasma of 180-g rats was maintained at approximately 10 nmol/ml for 24 hr and then started to rise, reaching 25 nmol/ml by 48 hr, in contrast to that of 50-g rats which fell to 2 nmol/ml by 48 hr. The concentration of paraquat in the lungs of the two groups of animals reflected this difference in plasma concentrations. The 50-g rats were also more resistant to paraquat when it was administered by sc injection (105 μmol/kg). Both the peak plasma and lung concentrations of paraquat were significantly less than in 180-g rats. We have, therefore, concluded that immature rats are less sensitive to paraquat than mature rats because less paraquat reaches the lung for a given dose. Paraquat concentrations in the lung are lower as a consequence of reduced plasma concentrations, which reflects a difference in the rate of clearance of paraquat by the kidneys of mature and immature rats. It is, therefore, unlikely that the difference in sensitivity of mature and immature rats to paraquat is related to the difference in sensitivity of these animals to high concentrations of oxygen. (Author abstract by permission)

77-2465 Rosenstein, L. ; Brice, A.; Rogers, N.; Lawrence, S. (EPA, Health Eff. Res. Lab., Research Triangle Park, NC) **Neurotoxicity of kepone in perinatal rats following in utero exposure.** *Toxicol. Appl. Pharmacol.* 41(1): 142-143; 1977.

A recent incident in a plant manufacturing Kepone (chlordecone) has given rise to many questions and few answers involving exposure to this highly toxic insecticide. A review of the available literature would suggest that the problem of perinatal neurotoxicity following low level exposure during gestation and through weaning has not been adequately addressed. It was thus the purpose of this investigation to evaluate possible neurotoxic effects in perinatal rats. In this study, pregnant females (Sprague-Dawley) received 1, 2, or 4 mg/kg/day of Kepone by gastric intubation beginning on Day 2 of gestation and terminating at weaning. The pesticide was administered using corn oil as the vehicle. Controls, receiving only corn oil, were used throughout the study. At parturition, all animals in the control and 1.0-mg/kg/day groups delivered healthy pups. Of the pregnant females receiving 2.0 mg/kg/day, only one-third delivered healthy pups. Pregnancies in the remaining animals resulted in stillbirths and abortions. At the highest dose level, the treatment was fetotoxic to all dams. Maternal body weights were obtained directly after birth and compared to dam weights on Day 3 of gestation. For the two highest treatment groups, the weight gains were significantly ($p < 0.05$) lower than the controls. On Day 15 postpartum a statistical difference ($p < 0.05$) also was observed in pups derived drom dams treated with 1.0 and 2.0 mg/kg/day of Kepone. At 24 days of age, the liters were divided into males and females and electroencephalograms and visual-evoked responses (VER) were obtained. The data indicated that the brain electrical activity of Kepone-treated perinates was significantly different from that of controls. This difference was not quite as evident in the dams. The perinatal VER, however, appeared normal. From the information just presented it would appear that Kepone, given at low levels, was relatively toxic to the gravid females and resulted in a high degree of fetoxicity with strong indications of CNS impairment in the perinatal rat. (Author abstract by permission)

77-2466 Reiter, L. ; Kidd, K.; Ledbetter, G.; Chernoff, N.; Gray, L. E., Jr. (U.S. EPA, Health Effects Res. Lab., Research Triangle Park, NC) **Comparative behavioral toxicology of mirex and kepone in the rat.** *Toxicol. Appl. Pharmacol.* 41(1): 143; 1977.

The acute toxicity of K epone (K,chlordecone) is reportedly three times higher than Mirex (M), its completely chlorinated analog. The present study compared the relative behavioral toxicity of these compounds during an 8-week exposure period. A total of 117 male, Sprague-Dawley rats were assigned to one of five treatment groups at 114 days of age. The pesticides were administered in ground Purina lab chow at levels of 0, 40 ppm M, 80 ppm M, 40 ppm K, and 80 ppm K. Within 2 weeks of treatment, K-exposed rats showed an exaggerated startle responses to a loud click (presented at 5-sec intervals), increased to 290 and 480% of control for 40 and 80 ppm K, respectively. The amplitude of this respnose was decreased in M-treated animals although no differences in habituation were observed. Ambulation in open field was significantly depressed in both treatment groups, falling to 66 and 58% of control for 80 ppm K and 80 ppm M, respectively. Interestingly, ambulation in a residential mazc was also depressed by 80 ppm M (83% of control) but showed a dose-related increase in the K-treated groups (130% of control at 80 ppm K). Finally, latency to emerge from the home cage was increased in K-treated animals (340% of control for 80 ppm K) and decreased in M-treated animals (50% control for 80 ppm M). These results indicate that although M and K have similar chemical structures, they produce dissimilar behaviorial effects in the rat. K treatment led to hyperreactivity as indicated by the exaggerated startle response, decreased ambulation in an open field, and delayed emergence time from the home cage. M treatment, on the other hand, produced a hyporeactivity with attenuated startle response, increased emergence time, and decreased abmulation. (Author abstract by permission)

77-2467 Tryphonas, L. ; Khera, K. S. (Bur. Chem. Saf., Health Prot. Branch, Health Welfare Canada, Ottawa, Canada) **Postnatal CNS effects of intrauterine exposure to ethylenethiourea in rats.** *Toxicol. Appl. Pharmacol.* 41(1): 143-144; 1977.

Ethylenethiourea (ETU), a degradation product of the ethylenebisthiocarbamate group of fungicides, is a potent rat teratogen. A wide spectrum of dose-dependent congenital deformities has been reported. A single oral dose of ETU, 30 mg/kg, given to Wistar rats on Day 14, 15, or 18 of gestation had no adverse effect on external morphology, weight, or number of pups at birth, but produced hydrocephalus and microphthalmia in 90% of offspring (0% in controls) dying until 9 weeks old. The anomaly was recognized on Days 6-9 of postnatal life, increased thereafter in severity and inci-

dence, and was fatal. Cross-fostering tests revealed that milk from treated dams was without any etiologic significance and that the anomaly might have been initiated prior to cross-suckling. Twenty-four percent of the offspring from dams treated on Day 15 that survived after 9 weeks had, in addition, motor impairment highlighted by a hopping gait associated with gross and histologic progressive degenerative lesions in the neuraxis. Both gross and histopathologic findings correlated well with the neurologic deficit and their slow rate of development accounted for the delayed appearance of the neurologic impairment. (Author abstract by permission)

77-2468 Koschier, F. J. ; Berndt, W. O. (Dep. Physiol. SUNY, Buffalo, NY, Dep. Pharmacol. Toxicol. Univ. Mississippi Med. Cent. Jackson, MS) **Renal proximal tubular transport after acute and short-term chronic administration of 2,-4,5-trichlorophenoxyacetic acid.** *Toxicol. Appl. Pharmacol.* 41(1): 148-149; 1977.

The organic acid herbicide 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), has been shown to alter the proximal tubular transport of organic acids and bases. This renal impairment appears to be competitive in nature, affecting the renal slice uptake of both acids and bases in a comparable manner. 2,4,5-T excretion is reduced after initial high doses of the herbicide, but improved with chronic (8-16 days) administration. In the present study male Sprague-Dawley rats were pretreated with 2,4,5-T in an alcohol vehicle sc. The slice transport studies were performed with conventional techniques. Eight days of 2,4,5-T pretreatment (90 mg/kg) failed to alter α-aminoisobutyrate (AIB) transport in a slice experiment on Day 9. However, the transport of 2,4-dichlorphenoxyacetate (2,4-D) was depressed approximately 66% and that of tetraethylammonium (TEA) depressed about 20%. Both changes were statistically significant. Pretreatment doses of 20 mg of 2,4,5-T/kg had no effects on renal transport of organic acids or bases, including 2,4,5-T itself. Renal cortex homogenate binding of 2,4,5-T was not altered by 5 days of pretreatment with 90 mg of 2,4,5-T/kg. Taken together, these data indicate that the altered excretory pattern for 2,4,5-T observed with chronic administration was not related to increased renal transport or alterations in nonspecific renal cortex binding. (Author abstract by permission)

77-2469 Benitz, K. F. ; Roth, R. N.; Coulston, F. (Inst. Comparative and Hum. Toxicol., Albany Med. Coll., Albany, NY) **Morphologic characteristics of hepatic nodules induced by mirex and dieldrin in mice.** *Toxicol. Appl. Pharmacol.* 41(1): 154-155; 1977.

The purpose of the present experiment was to study the sequence of hepatic changes in mice during dietary administration of dieldrin (not less than 85% of 1,2,3,4,10,10-hexachloro-exo-6,7-epoxy - 1,4,4,5,6,7,8,8- octahydro-1,4-endo exo-5,8-dimethanonaphthalene) and Mirex (dodecachlorooctahydro-1,3,4-methano-2H- cyclobut(ed)pentalene). Nine groups, each consisting of 100 male and 100 female mice (Charles River CD-1 strain), were fed dieldrin and Mirex in the diet in concentrations ranging from 0.15 to 15 ppm. Six hundred males and 600 females were used as controls. Groups of animals were sacrificed at various time intervals ranging from 2 to 25 months. At autopsy, the entire lung and representative samples of liver were fixed in 10% buffered formalin, and paraffin sections from this material were stained with hematoxylineosin, Masson's trichrome method, and Manuel's silver impregnation method. Initially, microscopic hepatic changes consisted of various degrees of centrilobular and pericentral hypertrophy. These changes were later associated with the appearance of hepatic nodules, and their occurrence was time and dose related. These nodules consisted of hypertrophic hepatocytes, which in a few instances were mixed with hyperplastic cells. Various degrees of loss and distortion of lobular architecture were seen within these nodules; however, anaplastic changes were absent. Lung metastases were observed in three animals which had hypertrophic hepatic nodules (15 ppm dieldrin for 25 months), indicating that the dieldrin-induced nodules have to be regarded as hepatocellular carcinomas. These metastases also consisted of hypertrophic hepatocytes. No metastases were seen in the Mirex animals which had hepatic nodules. The morphology of the hepatic nodules induced by dieldrin and Mirex did not allow a differentiation between those that metastasized and those that did not.

77-2470 Cabral, J. R. P. ; Shubik, P.; Mollner, T.; Raitano, F. (Eppley Inst. Res. Cancer, Univ. Nebraska Med. Cent., Omaha, NB) **Carcinogenic activity of hexachlorobenzene in hamsters.** *Toxicol. Appl. Pharmacol.* 41(1): 155; 1977.

Hexachlorobenzene (HCB) has been used as a fungicide in agriculture. In 1971 it was estimated that 13,800 lb of HCB were used in the United States for agricultural purposes. HCB is also a by-product in the manufacture of many chlorinated hydrocarbons, and in 1975 it was estimated that at least 2 million lb of HCB are produced every year in the U.S. Long-term studies, designed to evaluate the chronic toxicity of this compound, are not available. The present experiment seeks to determine whether or not HCB is carcinogenic. Syrian golden hamsters were given HCB mixed into the diet at the dose levels of 50 ppm (30 females and 30 males), 100 ppm (30 females and 30 males), and 200 ppm (60 females and 60 males) for the entire life span. A control group of 40 females and 40 males was also provided. Results at 80 weeks of age are presented. At this stage exposure to HCB resulted in a significant increase of hepatomas and liver hemangioendotheliomas. The capacity of HCB to induce hepatomas and their incidence (low dose: females 37.5%, males, 27.2%; medium dose: females, 42%, males, 75%; high dose:females, 81%, males, 87%) and latency appear related to the dose administered. No metastases were found. No hepatoma occurred in the control group. The incidence of liver hemangioendotheliomas in hamsters receiving 200 ppm was 9% in females and 34% in males. Three of the hemangioendotheliomas occurring in these males gave metastases. In view of the significantly greater number of tumors in male and female hamsters fed HCB in the diet for their entire life spans the results are considered as evidence of carcinogenicity of HCB. (Author abstract by permission)

77-2471 Chadwick, R. W. ; Copeland, M. F.; Chadwick, C. J. (EPA, Health Eff. Res. Lab., Research Triangle Park, NC) **Effect of dietary fiber on lindane metabolism.** *Toxicol. Appl. Pharmacol.* 41(1): 161-162; 1977.

Since dietary fiber has been shown to provide a protective effect against many toxicants, the increased ingestion of drugs, chemicals, and food additives accompanied by the relatively low dietary fiber intake could constitute a health hazard in the western world. Marked differences in the physical, chemical, and metabolic properties of various dietary fibers have been reported. The effect of various dietary fibers on the metabolism of the organochlorine insecticide lindane was investigated in this study. Thirty weanling, female Sprague-Dawley rats randomly assigned to one of five treatment groups were fed either a synthetic low residue diet (LRD), LRD + 10% pectin, LRD + 10% agar, LRD + 10% cellulose, or commercial lab chow for 1 month. The animals were then dosed with 2.87 mg of lindane (containing 1.66 μ Ci of [^{14}C]lindane) and were sacrificed 24 hr later. Urine, feces, fat, liver, kidney, and blood samples were taken for analysis. Although neither body nor kidney weights differed significantly, the livers of the rats on lab chow were significantly larger than those of other rats. Total excretion of radioactivity by rats on both lab chow and LRD + 10% pectin was significantly higher than that of the other animals. However, while the rats fed LDR + 10% pectin excreted a significantly higher level of radioactivity per gram of feces, the rats on lab chow excreted significantly more radioactivity in the urine. While the rats fed lab chow excreted significantly more conjugated chlorophenols than all other animals, those fed LDR + 10% pectin excreted significantly more conjugated chlorophenols than the rats fed LRD. Although there were no significant differences in microsomal protein, the hepatic microsomal cytochrome P-450 content of the rats fed the lab chow was significantly higher than all rats but those receiving LRD + 10% pectin. In vitro enzyme activity for the hydroxylation of chlorobenzenes and both the dehydrogenation and dechlorination of lindane was significantly higher in rats fed lab chow. All rats fed diets supplemented with fiber had higher dechlorinase activity than the animals receiving LRD only. Results indicate that some dietary fibers can exert a significant effect on the metabolism and excretion of lindane and its metabolites in mammals. (Author abstract by permission)

77-2472 Yoshida, T. ; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN) **Modification of cytochrome P-450 by the fungicide metabolite ethylene thiuram monosulfide.** *Toxicol. Appl. Pharmacol.* 41(1): 162; 1977.

Ethylene thiuram monosulfide (ETM) and ethylene thiourea (ETU) are major breakdown products of the ethylene-bis- dithiocarbamate fungicides. Recent work in this and other laboratories had indicated that a number of compounds, including ETU, which contain a thionosulfur group, are capable of strongly inhibiting the cytochrome P-450-containing mixed-function oxidase enzyme systems when administered in vivo or incubated with these enzyme systems in vitro. Since ETM also contains a thiono-sulfur group, it was of interest to examine the effect of ETM on hepatic mixed-function oxidase activity. Male Sprague-Dawley rats were sacrificed at the appropriate times. ETM at doses of 1, 2, and 5 mmol/kg significantly inhibited both benzphetamine demethylation and aniline hydroxylation measured 24 hr after its administration. The administration of ETM also decreased the concentration of cytochrome P-450 and protoheme in microsomes, suggesting that the inhibition of mixed-function oxidase activity by ETM was due to a decrease in the concentration of cytochrome P-450. To examine its mode of action, ETM was incubated in vitro with microsomes in the presence and absence of an NADPH-generating system. An inhibition of mixed-function oxidase activity by ETM (1×10^{-3} M) was observed in both the presence and absence of NADPH. This inhibition seen in vitro was mainly due to a conversion of cytochrome P-450 to P-420. The extent of the conversion depended on both incubation time and the concentration of ETM. This conversion of cyofchrome P-450 to P-420 was prevented by the addition of reduced gluthathione to the incubation prior to ETM but could not be completely reversed if glutathione was added after ETM. The present findings demonstrate that ETM, like ETU, acts as an inhibitor of the hepatic mixed-function oxidase enzyme system both in vivo and in vitro. However, the mode of action of ETM in vitro differs from that of other thiono-sulfur- containing compounds so far examined, including ETU. (Author abstract by permission)

77-2473 Sauerhoff, M. W. ; Chenoweth, M. B.; Gordon, H. L.; Braun, W. H.; Blau, G. E.; Gehring, P. J. (Toxicol. Res. Lab., Dow Chem. Co., Midland, MI) **The fate of silvex following oral administration to humans.** *Toxicol. Appl. Pharmacol.* 41(1): 162-163; 1977.

The fate of silvex, 2-(2,4,5-trichlorophenoxy) propanoic acid, was defined in seven men and one woman following oral administration of 1 mg/kg. No adverse effects were observed. Samples of blood plasma, urine, and feces were collected at designated time intervals through 168 hr. Plasma samples were analyzed for silvex only while samples of urine and feces were analyzed for silvex, silvex conjugate(s), 2,4,5-trichlorophenol, and 2,4,5-trichlorophenol conjugate(s). Apparent first-order kinetics described the biphasic clearance of silvex from plasma and excretion in urine. The half-life values for clearance of silvex from plasma were 4.0 1.9 and 16.5 7.3 hr for the initial and terminal phases, respectively. Peak plasma concentrations of silvex occurred within 2 to 4 hr after dosage. Within 24 hr following administration, 65% of the administered dose had been excreted in urine. Silvex was excreted in urine as silvex and a silvex conjugate(s). The half-life values for excretion of silvex per se in urine were 5.0 1.8 and 25.9 6.3 hr for the two phases, respectively. Small amounts (3.2% or less) of silvex and/or silvex conjugate(s) were eliminated in feces. Recovery of silvex and its conjugate(s) in urine and feces through 168 hr ranged from 66.6 to 95.1% of the administered dose with a mean value and SD of 80.3 10.5%. In man, silvex is readily absorbed following ingestion and subsequently readily excreted predominantly via the urine. (Author abstract by permission)

77-2474 Abou-Donia, M. B. (Dep. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC) **Increased acid phosphatase activity in hens following long-term low-level oral administration of leptophos.** *Toxicol. Appl. Pharmacol.* 41(1): 169; 1977.

Leptophos [*O*-(4-bromo-2,5- dichlorophenyl) *O*-methyl phenylphosphonothioate] is a new organophosphorus insecticide that produces neurological deficits in hens similar to that caused by tri-*o*-cresyl phosphate (Abou-Donia and Preissig, *Toxicol. Appl. Pharmacol.* 35, 269, 1976). This study reports the possible role for hydrolytic enzymes in the mechanism of organophosphorus ester-induced delayed neurtoxicity (OPIDN). Six groups of laying hens were given daily a single oral dose of 0.5, 1, 2.5, 5, 10, and 20 mg/kg in gelatin capsules for 72, 156, 128, 128 and 36 days, respectively. All hens fed 1, 2.5, 5, 10, and 20 mg/kg developed ataxia after 62-68, 59-70, 48-59, 34-39, and 31 days. Hens given 0.5 mg/kg daily showed only weakness of the legs. The condition of hens given 20 mg/kg progressed to paralysis (33-40 days). The "latent period" and "total dose" before onset of ataxia depended on the daily dose. Spinal cord and sciatic nerves of ataxic hens exhibited axon and myelin degeneration. There was a dose-dependent inhibition of plasma cholinesterase; 20 mg/kg produced 58% depression of enzyme activity at time of sacrifice (130 days). Plasma acid phosphatase in all treatment groups significantly increased. The increase over the control ranged between 36 and 190% for hens receiving daily oral doses of 0.5 and 20 mg/kg of leptophos. The increased activity of acid phosphatase correlates with the clinical signs following the oral administration of the insecticide. It is suggested that the increase in plasma acid phosphatase activity accompanied by a decrease in plasma cholinesterase activity may be used as a biochemical index for an early diagnosis of OPIDN. (Author abstract by permission)

77-2475 DeVore, D. P. ; Hutson, T. H.; Sheridan, M. A.; Pitman, J. S. (Battelle, Columbus Labs., Columbus, OH) **Pesticide toxicity in cultured mammalian cells.** *Toxicol. Appl. Pharamcol.* 41(1): 169-170; 1977.

Aldrin, dieldrin, and parathion at maximal soluble concentrations of approximately 86, 10, and 13 μg/ml, respectively, increased cellular concentrations of cyclic AMP (cAMP). Aldrin and parathion at maximum soluble concentrations completely inhibited cellular utilization of ^{3}H-labeled amino acids after 15 min. Paraoxon at a soluble concentration of 100 μg/ml had little effect on either cellular uptake or macromolecular incorporation of ^{3}H-labeled amino acids. Prescreen confluency assays showed similar trends. Concentrations of aldrin and parathion yielding 50% confluency were approximately 45 and 10 μg/ml, respectively. Paraoxon at concentrations as high as 100 μg/ml had only slight effects on monolayer growth. Inhibitory effects of parathion and aldrin on [^{3}H]thymidine utilization by synchronized HeLa cells were also shown. In preliminary studies to examine toxic mechanisms, aldrin effects on cellular ATP concentrations were determined, with ATP concentrations being grossly affected and decreased following aldrin incubation. (Author abstract by permission, abridged)

77-2476 Yim, G. K. W. ; Nolan, V.; Lund, A. (Dep. Pharamcol., Toxicol., Entomol., Purdue Univ., W. Lafayette, IN) **Similar toxic and cardiovascular actions of the pesticide chlordimeform and local anesthetics.** *Toxicol. Appl. Pharmacol.* 41(1): 170; 1977.

Since chlordimeform (CDM) was shown to have local anesthetic activity (0.6 x procaine) on isolated frog sciatic nerves (*Fed. Proc.* 35, 729, 1976), other actions of CDM were examined for possible similarities to those of local anesthetics. As with local anesthetics, diazepam and pentobarbital reduced the incidence of convulsions and death following CDM (100 mg/kg ip in mice), whereas phenytoin, tridione, and mephenesin were ineffective. In pentobarbital anesthetized dogs, CDM (3-30 mg/kg) reversibly lowered blood pressure by direct myocardial depression and peripheral vasodialation. This depressor response was unaffected by autonomic and histaminic blockade, and was followed by a centrally mediated pressor response that could be blocked by diazepam. At higher doses (50-75 mg/kg) CDM caused simultaneous respiratory arrest and irreversible hypotension that could not be prevented by artificial respiration. Comparable effects were observed following lidocaine (1-20 mg/kg). These results provide additional evidence that CDM toxicity in mammals is due largely to actions that are shared by local anesthetics. (Author abstract by permission)

77-2477 Iatropoulos, M. J. ; Felt, R.; Coulston, F.; Korte, F. (Int. Cent. Environ. Saf., Albany Med. Coll., Holloman AFB, NM) **Histopathology of low chlorinated biphenyls and hexachlorobenzene in female Rhesus monkeys.** *Toxicol. Appl. Pharmacol.* 41(1): 173; 1977.

The toxicology of Clophen A-30, a mixture of low chlorinated biphenyls used in Germany, has been investigated. The morphological effects of Clophen A-30, 2,5,4'-trichlorobiphenyl (TCB), and hexachlorobenzene (HCB) were compared in adult female rhesus monkeys. Clophen was given daily by stomach tube for 28 days in amounts of 4, 16, and 64 mg/kg. Radiolabeled TCB was given for 84 days in the diet at a dose of 0.25 mg/kg; half of these animals were sacrificed at 85 days and half were allowed to recover for 28 days prior to sacrifice. HCB was administered daily by gavage for 60 days in amounts of 8, 32, 64, and 128 mg/kg. Complete histopathological examination revealed dose-dependent degenerative changes in the liver, kidney, and central nervous system (CNS) of the animals receiving Clophen A-30. The CNS changes included a decrease in the amount of stainable myelin in the fiber tracts. TCB-reversible changes were observed involving the endothelial cells of small vessels of most organs, with secondary hypoxia and degenerative changes in the CNS, liver, and kidney. Finally, examination of HCB animals showed thymic cortical atrophy, degenerative ovarian changes, and degenerative changes in the liver and kidneys. (Author abstract by permission)

77-2478 Iatropoulos, M. J. ; Hobson, W.; Coulston, F.; Korte, F. (Int. Cent. Environ. Saf., Albany Med. Coll., Holloman AFB, NM) **Lactation-transfer changes caused by clophen A-30 and hexachlorobenzene in male and female infant rhesus monkeys.** *Toxicol. Appl. Pharmacol.* 41(1): 173; 1977.

The effects of Clophen A-30 (mixture of low chlorinated biphenyls) and hexachlorobenzene (HCB) were compared in infant monkeys through administration to their lactating mothers. Clophen was given by gavage daily during lactation in the amount of 16 mg/kg. Two received Clophen for 22 days, and their infants were sacrificed at 66 and 147 days postpartum. A third mother received Clophen for 28 days and her infant was sacrificed at 110 days postpartum. HCB (64 mg/kg) was given daily by stomach tube for 22, 38, and 60 days. The infants were sacrificed at 37, 122, and 81 days postpartum, respectively. The variation in the time of sacrifice of the infants was dictated by the condition of their mothers. The histopathological examination of the Clophen infants revealed degenerative changes of slight to moderate degree of severity in the liver, kidney, and central nervous system. The severity of changes increased with age. HCB infants showed only mild degenerative changes in the liver and kidney. These changes did not show any correlation to the age of the infant. (Author abstract by permission)

77-2479 Yang, K. H.; Guiney, P. D.; Seymour, J. L. Peterson, R. E. (Sch. Pharm. Reg. Primate Res. Cent., Univ. Wisconsin, Madison, WI) **2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD)-induced depression in biliary excretion of polychlorinated biphenyls (PCBs) in rats.** *Toxicol. Appl. Pharmacol.* 41(1): 174; 1977.

TCDD was given as a single oral dose, 10 or 25 μg/kg, to male rats (230-340 g). Ten days post-treatment the rats were anesthetized, the common bile duct, femoral artery, and vein were cannulated, and 6 mg/kg of [2,5,2′,5′-^{3}H]tetrachlorobiphenyl (4-CB) or [2,4,5,2′,5′-^{3}H]hexachlorobiphenyl (6-CB) administered iv. Plasma disappearance of ^{3}H was similar in control and TCDD-treated rats for both PCBs. In addition to higher hepatic content and concentration of 4-CB and 6-CB at 4 hr, both doses of TCDD produced an increase in liver weight, a decrease in bile flow, and a decrease in biliary excretion of 4-CB and 6-CB. Content of 4-CB- and 6-CB-derived MH in perirenal fat, foreleg skeletal muscle and urine 4 hr after administration tended to be similar to TCDD-treated and control rats, but skin concentration of both PCBs was less in the TCDD treatment groups. (Author abstract by permission, abridged)

77-2480 Mehendale, H. M. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Cent., Jackson, MS) **Pesticide-induced impairment of hepatobiliary function.** *Toxicol. Appl. Pharmacol.* 41(1): 176; 1977.

The effect of preexposure to hexachlorobenzene (HCB), DDT (both at 100 ppm, in diet, 8 days), and toxaphene (TX) (20 mg/kg, po, 5 days) on the biliary excretory function was investigated using isolated perfused liver (IPL) preparations obtained from treated and control rats. Preexposure to HCB caused an increase (28%) in the biliary excretion of endogenously formed metabolites of imipramine (IMP) while DDT and TX pretreatment caused no significant effect. However, biliary excretion of otherwise readily excretable, exogenously provided, polar metabolites of IMP was suppressed after preexposure to all three pesticides. These results are consistent with the hypothesis that liver maintains two pools of metabolites, viz., one representing a synthetic phase and the other representing postsynthetic phase of metabolite synthesis. Moreover, modifying agents affect biliary excretion of metabolites from the two pools via discrete mechanisms. Biliary excretion of an acid nonmetabolizable transport model compound, chlorothiazide, was unaffected by HCB, while biliary excretion of a neutral transport model compound, ouabain, was enhanced after preexposure to HCB. These results suggest that although impairment of hepatobiliary function may be apparent as a generalized effect, use of model transport substrates would be useful in dissecting discretely distinguishable manifestations exerted by toxic agents. (Author abstract by permission)

77-2481 Marshall, T. C. ; Dorough, H. W. (Dep. Entomol. Grad. Program Toxicol., Univ. Kentucky, Lexington, KY) **Bioavailability in rats of bound and conjugated plant residues of carbamate insecticides.** *Toxicol. Appl. Pharmacol.* 41(1): 176-177; 1977.

Bound and conjugated forms of pesticides and/or their metabolites may occur as major terminal residues in plants destined for human consumption. The potential bioavailability of such residues in mammals was investigated by administering bound or conjugated plant metabolites of four ^{14}C-labeled methylcarbamate insecticides (carbaryl, carbofuran, aldicarb, and Croneton (ethiofencarb); the latter is an experimental material, 2-ethylthiomethylphenyl methylcarbamate) orally to female Sprague-Dawley rats. Bound ^{14}C residues (those remaining in the plant matrix after thorough solvent extraction) from carbaryl- and carbofuran-treated bean plants were voided by the rats predominately via the feces (99 and 79% of dose), with 1 and 8% detected in the urine. Bile duct cannulation experiments showed that a maximum of 1.5% of the doses was present in the bile. Similar results were obtained using bound residues of Croneton formed by sorghum plants. quantities of bound residues of aldicarb were insufficient for testing. Conjugated, or water-soluble, residues of each insecticide were rapidly eliminated in the urine; generally, greater than 90% of a dose was voided in the 0- to 24-hr urine. These data demonstrate that bound residues of the test compounds were very poorly absorbed from the gastrointestinal tract of rats, while the conjugated ones were readily absorbed. Thus, the latter appear to be of greater significance as residues in plant or animal products consumed by man. (Author abstract by permission)

77-2482 Albert, J. R. ; Stearns, S. M.; Mersmann, H. J. (Shell Develop. Co., Biol. Sci. Res. Ctr., Modesto, CA) **In vivo and in vitro effects of di-*N*-alkyl 2,2-dichlorovinyl phosphoric acid esters on hen brain neurotoxic esterase.** *Toxicol. Appl. Pharmacol.* 41(1): 177; 1977.

The delayed neurotoxic effects of a series of bis and mixed *n*-alkyl 2,2-dichlorovinyl phosphoric acid esters in the hen were reported previously (*Tox. Appl. Pharmacol.* 29, 136, 1974). A number of these esters have been assayed for their *in vivo* and *in vitro* effects on hen brain neurotoxic esterase. After single oral dosage of high (lethal or neurotoxxic) and low doses to groups of five hens, the degree of inhibition of brain neurotoxic esterase was determined at 3 and 24 hr and at 22 days. Essentially the technique of Johnson (*Crit. Rev. Tox.*, 1975) was used for the *in vitro* studies: a pooled hen brain homogenate with phenyl phenylacetate as a substrate and a 10-min incubation period of 25°C. *In vivo*, at neurotoxic

doses, TOTP, mipafox, and the bis C_4 ester homolog of dichlorvos resulted in 88, 86, and 92% inhibition. The nonneurotoxic compounds, dichlorvos and paraoxon, at lethal doses (atropine pretreatment) caused 36 and 42% inhibition, respectively. *In vitro* the IC50 decreased with increasing chain length (dichlorvos IC50, 104 μM; C_4 analog IC50, 0.08 μM). Longer alkyl chains were less potent. The inhibitory potency of mixed methyl, *n*-alkyl esters of varying chain length paralleled the effects of the bis series. The most potent ester *in vitro* was the bis chloroethyl ester with an IC50 of 0.03 μM. Overall, the IC50 relationships parallel the grossly observable delayed neurotoxic ED50 values determined previously and in general support Johnson's hypothesis that when the degree of inhibition of the enzyme exceeds 80% *in vitro*, it is indicative of a neurotoxic effect. (Author abstract by permission)

77-2483 Allen, J. R. ; Barsotti, D. A.; van Miller, J. P. (Dep. Pathol., Reg. Primate Res. Cent., Univ. Wisconsin, Madison, WI) **Reproductive dysfunction in nonhuman primates exposed to dioxins.** *Toxicol. Appl. Pharmacol.* 41(1): 177; 1977.

2,3,7,8-Tetrachlorodibenzo- *p*-dioxin (TCDD), one of the most lethal environmental contaminants known, produces intoxication in adult female rhesus monkeys within 6 months. They showed a loss of hair about the head and shoulders, dermatitis, swelling of the eyelids, loss of eyelashes, and irregularities in the menstrual cycles when TCDD was added to their diets at a level of 500 parts per trillion. Radioimmunoassays of the serum estrogen and progesterone revealed a decrease in, and prolongation of, the progesterone peak during the luteal phase of the cycle. Repeated breedings of the 8 females following 6 months of TCDD exposure (mean total intake, 11.7 μg) have resulted in two pregnancies, one of which was aborted on Day 46. After 9 months on the TCDD diet, all of the animals experienced an anemia and leukopenia, and the detmatitis and loss of hair were more extensive. Although the food intake of the animals did not decrease, the majority of them experienced a gradual weight loss. One of the eight animals died, after 8 months on the experimental diet, from a severe nonresponsive aplastic anemia. These data indicate that continuous exposure of nonhuman primates to low levels of TCDD is capable of producing widespread deleterious effects, particularly on the reproductive and hematopoietic systems. (Author abstract by permission)

77-2484 Schein, L. ; Thomas, J. A.; Donovan, M. P. (Dep. Pharmacol., West Virginia Univ. Med. Cent., Morgantown, WV) **Effects of pesticides on steroid hormone binding in cytoplasm of rodent tissues.** *Toxicol. Appl. Pharmacol.* 41(1): 178; 1977.

Specific androgen and estrogen binding proteins have been prepared from several steroid target and nontarget organs of castrate mice. Using a dextran-coated charcoal separation procedure to distinguish bound steroid from unbound steroid provided a screening procedure to assess the potential of certain pesticides (viz., methoxychlor, heptachlor, DDT, dieldrin, diazonon, parathion, carbaryl, or carbofuran) to complete with male of female sex hormone for the steroidophilic molecules. Parathion (10 μM) was capable of interfering with the binding of [^{3}H]dihydrotestosterone ([^{3}H]DHT]) to specific cytosol receptors in the accessory sex organs, the kidney, and the liver. Similar in vitro concentrations of methoxychlor, hepatachlor, DDT, dieldrin, diazonon, carbaryl, or carbofuran were unable to interfere with the binding of [^{3}H]DHT to its cytosol receptor. There was little tendency for any of the pesticides studied to interfere with the binding of [^{3}H]estradiol ([^{3}H]E_2) to its specific cytosol receptor. However, in the liver most pesticides caused marked elevations in the binding of [^{3}H]E_2 to estrophilic molecules. These preliminary studies would seem to indicate that organophosphates (viz., parathion) can affect androphil-[^{3}H]DHT interactions, and that estrophil-[^{3}H]E_2 interactions can be increased by the several chemical classes of pesticides. (Author abstract by permission)

77-2485 Berteau, P. E. ; Deen, W. A.; Dimmick, R. L. (Univ. California, Sch. Public Health, Naval Biosci. Lab., Naval Supply Cent., Oakland, CA) **Effect of particle size on the inhalation toxicity of naled aerosols.** *Toxicol. Appl. Pharmacol.* 41(1): 183; 1977.

Ultra-low-volume (ULV) dispersal of pesticide aerosols in the field is increasing. These aerosols contain more particles in the respirable range than do aerosols generated from conventional foggers. To determine if one pesticide, dispersed as particles in this range, was more toxic to mammals than when dispersed as aerosols where most particles were in a larger range, we exposed groups of eight female rats, constrained in head-only exposure units, either to aerosols of naled (1,2-dibromo-2,2-dichloroethyl dimethyl phosphate) concentrate (mass median diameter, MMD, 21. μm), generated from Wells-type refluxing atomizers, or to larger particle aerosols (MMD, 13-20 μm) of the same insecticide formulation generated from an electrically driven spinning disk. Aerosol concentration was about 1.3 mg/liter in both cases. Exposure was continued until there was evidence of mortality, but never longer than 65 min. Dosage was calculated as LD50 (mg/kg) from the insecticide concentration (mg/liter of air), exposure time (min) respiratory minute volume (ml/min/g), and the estimated deposition (%) of the inhaled material. The LD50 value was 3.2 mg/kg for the small-particle aerosol but was greater than 12.4 mg/kg (25% mortality at this level) for the large-particle aerosol. Thus, naled aerosols, as respirable particles, were at least four times more toxic than the larger particles. Inhalation toxicity of small particle aerosols decreased to about half (LD50, 7.7 mg/kg), when the concentrate was diluted with vegetable oil, but was still about 20 times greater than the oral toxicity (LD50, 160 mg/kg). ULV spraying of naled may present a greater hazard to the poorly protected worker than conventional sprays. (Author abstract by permission)

77-2486 Silver, E. H. ; Murphy, S. D. (Dep. Physiol., Harvard Univ. Sch. Public Health, Boston, MA) **The influ-**

ence of esterase inhibition on the hepatotoxicity of esters of allyl alcohol in rats. *Toxicol. Appl. Pharmacol.* 41(1): 186-187; 1977.

Modification of carboxylesterase activity was used to determine the importance of enzymatically mediated hydrolysis in the production of liver injury by esters of allyl alcohol. Triothotolyl phosphate (TOTP, 125 mg/kg), 0.5, 1, 2, 4, 6, or 10 mg/kg of the defoliant *S,S,S*-tributyl- phosphorotrithioate (DEF), or corn oil (1 mg/kg) was administered ip to male rats. Eighteen hours later the esters allyl acetate, allyl cinnamate, or allyl phenoxyacetate were administered po to the pretreated, fasted animals. TOTP pretreatment significantly inhibited the rise in plasma alanine-α-ketoglutarate (AKT) activity at 8 hr after treatment with allyl acetate (60, 90, 120, and 150 mg/kg). This protection by TOTP was also observed at 16 and 24 hr after allyl acetate. TOTP also prevented changes in liver morphology produced by allyl acetate. Pretreatment with 0.5 mg/kg DEF inhibited liver esterase 28% and reduced the elevation in plasma AKT activity caused by 60 mg/kg allyl acetate. DEF (4 mg/kg), which produced 85% inhibition of liver esterase, completely protected against the hepatic injury produced by 60 mg/kg allyl acetate. TOTP prevented the elevation in plasma AKT activity induced by 250, 400, and 600 mg/kg allyl cinnamate. TOTP pretreatment prevented liver injury produced by 200 mg/kg, but not that produced by 250 or 400 mg/kg of allyl phenoxyacetate. Plasma AKT activity, however, was significantly lower in TOTP-pretreated animals compared with corn oil-pretreated animals that received 250 mg/kg allyl phenoxyacetate. The hydrolysis of all three esters of allyl alcohol *in vitro* was greatly inhibited when liver homogenates from TOTP-pretreated rats were used. The results indicate that enzymatic hydrolysis is a necessary step in the activation of the esters allyl acetate and allyl cinnamate to hepatotoxins. Since esterase inhibition was only weakly protective against the hepatotoxic effect of allyl phenoxyacetate, other mechanisms may be involved in the toxic action of this ester. (Author abstract by permission)

77-2487 Mayes, B. ; Abraham, R.; Coulston, F. (Inst. Comp. Human Toxicol., Albany Med. Coll., Albany NY) **Alterations of hepatic nuclear ploidy in rodents by PCB and mirex.** *Toxicol. Appl. Pharmacol.* 41(1): 189; 1977.

Previous studies indicated that combining two chlorinated hydrocarbons causes hyperplasia in mammalian livers in contrast to hypertropy induced by administering the compounds separately. Studies were therefore undertaken to determine the classes of liver cells involved in hypertrophy and hyperplasia by employing quantitative and qualitative techniques for detecting such changes. Two chlorinated hydrocarbons, polychlorinated biphenyls (PCB) (Aroclor 1254) and Mirex were given to 6- to 7-week-old mice (Charles River CD-1) by gavage for up to 7 days: Group I, corn oil; Group II, 25 mg/kg PCB; Group III, 4.5 mg/kg Mirex; Group IV, 25 mg/kg PCB and 4.5 mg/kg Mirex. Isolated liver nuclei were counted and the volumes were measured on an electronic Coulter counter. After 4 days, in Group II, only diploid cells were decreased in frequency with little change in volume; in Group III the tetra- and octoploid cells were affected predominantly with a marginal increase in nuclear volume, whereas in Group IV a further increase in tetra- and octoploid volumes were noted as well as an increase in the relative frequency of octoploid cells. At 7 days in Group III the octoploid nuclear volumes and in Group IV the tetraploid nuclear volumes were increased. In addition, in Group IV the frequency of diploids was increased. Autoradiographic analysis revealed a 2- and 3-fold increase in labeled hepatocytes and endothelial cells in periportal and midzonal regions of Group II, a 4-fold increase of similar cells in midzonal regions in Group III, and a 10- and 6-fold increase midzonally in Group IV. These studies reveal that chemicals effect different classes of hepatocytes and that the type of hepatocyte so affected determines whether the liver responds by hypertrophy or hyperplasia. These short-term, high-dose studies, by employing the present techniques, might provide good indicators of the long-range effects of environmental chemicals. (Author abstract by permission)

77-2488 Bell, J. U. (Dep. Pharmacol., West Virginia Univ. Med. Cent., Morgantown, WV) **The reactivation of plasma cholinesterase in human fetus and adult following in vitro exposure to the organophosphate, dichlorvos.** *Toxicol. Appl. Pharmacol.* 41(1): 191; 1977.

Reactivation of organophosphate inhibited plasma cholinesterase (EC 3.1.1.8) may occur spontaneously or in response to treatment with specific chemical compounds (e.g., pralidoxime chloride). In this project, both spontaneous and chemically induced reactivation were studied using as an enzyme source plasma obtained from nonpregnant females, pregnant females at term, and their respective neonates, sampled immediately following delivery. Aliquots of plasma were incubated with dichlorvos (1 μM) for 5 min at 37°C resulting in a 96% inhibition of cholinesterase in all three groups. Following the 5-min exposure to the organophosphate, either pralidoxime chloride (1 μM) or an equivalent volume of saline was added to the reaction flask and the restoration of cholinesterase activity was monitored over the next 120 min. Pralidoxime mediated cholinesterase reactivation in "nonpregnancy" plasma was significantly greater than that observed in either "maternal" of "fetal" plasma; however, no significant difference was noted in reactivation rates for these latter two groups. Significant differences were also observed in the rates of spontaneous reactivation and these were found to correlate fairly well ($r = 0.75$) with plasma arylesterase (EC 3.1.1.2) activities. However, after correcting for this spontaneous reactivation, there will still significant differences in the rates of pralidoxime mediated reactivation (nonpregnant > pregnant > fetal). (Author abstract by permission)

77-2489 Dilley, J. V. ; Chernoff, N.; Kay, D.; Winslow, N.; Newell, G. W. (Stanford Res. Inst., Menlo Park, CA) **Inhalation teratology studies of five chemicals in rats.** *Toxicol. Appl. Pharmacol.* 41(1): 196; 1977.

Pregnant rats were exposed daily to chloroform vapors or aerosols of ethylenethiourea, thimet, simazine, or bromacil during Days 7 through 14 of gestation. The highest

concentrations for each exposure were: chloroform, 20.1 1.2 g/m³; ethylenethiourea, 120.4 8.0 mg/m³, thimet, 1.94 0.48 mg/m³; simazine, 317 89 mg/m³; and bromacil, 165 6 mg/m³. Two lower concentrations of each compound were used simultaneously with the highest dose, with all vapor/aerosol exposures generated from a single source for each compound. All animals were sacrificed on Day 20 of gestation, and the dams and fetuses were examined for gross changes. Fetuses were fixed in Bouin's solution or alcohol and examined later for teratology. Chloroform, ethylenethiourea, and Thimet caused increased fetal mortality and decreased fetal weight gain. Simazine and Bromacil did not cause any prenatal changes. None of the compounds were teratogenic at the concentrations used and under these experimental conditions. (Author abstract by permission)

77-2490 Poole, D. C. ; Simmon, V. F.; Newell, G. W. (Stanford Res. Inst., Menlo Park, CA) **In vitro mutagenic activity of fourteen pesticides.** *Toxicol. Appl. Pharmacol.* 41(1): 196; 1977.

As part of the EPA's substitute pesticide program, mutagenic studies are being conducted on many pesticides. In the current study, 14 pesticides were evaluated for their mutagenic protential in five microbial assay systems. The 14 pesticides tested were: Aspon, Acephage, Carbofuran, Chloropyrifos, Crotoxphyos, Diazinon, Dicamba, Demeton, Disulfoton, Fensulfothion, Fonofos, Trichlorophon, Siduron, and Methoxychlor. THe microbial assay systems used were the histidine reverse mutation system in five strains of *Salmonella typhimurium* (TA 1535, TA1537, TA1538, T98, and TA100), the trypotphan mutation system in *Escherichia coli* WP2, the mitotic recombination assay in *Saccharomyces cerevisiae* D3, and relative toxicity assays in *Escherichia coli* and *Bacillus subtilis.* A mammalian metabolic activation system using the liver of rats that had been treated with Aroclor 1254 was used in all assays except the *E. coli* and *B. subtilis* relative toxicity assays. Demeton increased the mutation frequency in *S. typhimurium* TA 1535 and TA100 and in *E. coli* WP2 and increased mitotic recombination in *S. cerevisiae* D3. Trichlorphos and acephate increased the mutation frequency in *S. typhimurium* TA100 and *E. coli* WP2 and the mitotic recombination frequency in *S. cerevisiae* D3. Crotoxyphos increased the mitotic recombination frequency in *S. cerevisiae* D3. None of the other pesticides was mutagenic. The relative toxicity assays have not yet been completed. (Author abstract by permission)

77-2491 Villeneuve, D. C. ; Yagminas, A.; Chu, I.; Marino, I. A. (Biochem. Toxicol. Sect., Environ. Health Directorate, Health Prot. Branch, Ottawa, Ontario, Canada) **Effects of food deprivation in rats previously exposed to mirex.** *Toxicol. Appl. Pharmacol.* 41(1): 200; 1977.

The present study was carried out as part of a general program designed to determine the effects of food deprivation on the toxicity of pesticides. Adult male rats were dosed daily with Mirex by gavage for 14 days at levels of 0, 0.1, 1.0, and 10 mg/kg. The food intake of these animals was then reduced to 25% of their normal consumption. After 8 days, the animals were anesthetized and blood was removed via the adbominal aorta. Following death, organs were weighed and stored frozen pending residue analysis. Liver was analyzed for microsomal enzyme activity and a portion examined microsocopically for lesions. Routine hematology was carried out on all blood samples and serum analyzed for sorbital dehydrogenase and lactic dehydrogenase activities. Food restriction caused mobilization of the Mirex stored in fat deposts and resulted in increased Mirex level in the brain, heart, and spleen. No hematological abnormalities were observed. Mirex was observed in induce microsomal enzyme activity at all levels tested, an effect which was not increased by food deprivation. Lactic dehydrogenase activity was increased at 1.0 and 10 mg/kg and sorbital dehydrogenase activity increased at 10 mg/kg in animals on normal food intake. The same effects were observed in animals subjected to restricted food intake. The results from this study indicate that although the tissue distribution of Mirex was altered by food deprivation, there was only slight increase in the biological activity of this compound. (Author abstract by permission)

77-2492 Murray, F. J. ; Smith, F. A.; Nitschke, K. D.; Humiston, C. G.; Kociba, R. J.; Schwetz, B. A. (Toxicol. Res. Lab., Health and Environ. Res., Dow Chem. U.S.A., Midland, MI) **Three-generation reproduction study of rats ingesting 2,3,7,8-tetrachlorodibenzo-p-dioxin.** *Toxicol. Appl. Pharmacol.* 41(1): 200-201; 1977.

2,3,7,8-Tetrachlorobenzo- p-dioxin (TCDD) is a highly toxic contaminant formed in the production of trichlorophenol. A three-generation reproduction study was conducted to evaluate the effects of chronic, low-lever ingestion of TCDD. Sprague-Dawley rats were maintained continuously on diets providing dose levels of 0. 0.001, 0.01, or 0.1 μg of TCDD/kg/day. No signs of toxicity were noted in fo rats of either sex during 90 days of TCDD ingestion prior to mating. The fertility of the fo rats receiving 0.1 μg/kg/day was decreased to an extent which, combined with a poor survival rate in the few litters born, precluded continuation of this dose level in subsequent generations. At 0.01 μg/kg/day, fertility was significantly decreased in the f_1 and f_2 but not fo generations. At 0.001 μg/kg/day, no deleterious effect on fertility was seen in any generation. Indications of toxicity clearly evident at 0.01 μg/kg/day among the f_2 and f_1 but not f_1 litters included smaller litter size at birth, plus decreased survival and growth of neomates. Among litters of rats receiving 0.001 μg/kg/day, not effect on litter size at birth or neonatal growth was observed in any generation; statistically significant increases and decreases in pup survival were seen at 0.001 μg/kg/day. At 0.01 μ/kg/day, the weights of the liver (relative to body weight) and thymus (relative and absolute) were increased and decreased, respectively, in the wealings. At 0.001 μg/kg/day, there was a trend toward increased relative liver weight. Microscopic examination of the liver, kidney, and thymus of weanlings at 0.001 or 0.01 μg/kg/day revealed no evidence of toxicity. Dilated renal pelvises were seen in the three f_1 rats at the high dose level which survived to adulthood. Sporadic increases in the frequency of dilated

renal pelvis occurred in wealings at lower dose levels in a manner which was not dose-related or consistent from generation to generation. In summary, the reproductive capacity of rats ingesting TCDD was clearly affected at dose levels of 0.01 and 0.1 μg/kg/day, but not at 0.001 μ/kg/day, through three successive generations. (Author abstract by permission)

77-2493 Loose, L. D. ; Pittman, K. A.; Benitz, K.; Silkworth, J. B. (Inst. Comp. Hum. Toxicol., Albany Med. Coll., Albany, NY) **PCB- and HCB-induced immunosuppression in mice.** *Toxicol. Appl. Pharmacol.* 41(1): 201-202; 1977.

Although the lymphoid histological effect induced by such environmental chemicals as polychlorinated biphenyls (PCB) would suggest a functional effect on immunological parameters, scant evidence is available delineating the influence of environmental chemicals on immune responses. The present study was undertaken to evaluate the effect of two organochlorines on humoral antibody and immunoglobulin formations in mice. Balb/c mice were fed diets containing 167 ppm of ARoclor 1242 (PCB) or hexachlorobenzene (HCB) for 6 weeks, at which time the mice received a primary immunization of 0.1 ml of 10% sheep erythrocytes (SRBC). The animals were maintained on their respective diets during the immunization period. An approximately twofold increase in primary and secondary splenic antibody plaque-forming cell (PFC) formation was manifested in control mice as compared to that observed in mice exposed to PCB or HCB. Control mice elicited a peak primary response of 233 PCG/10^6 spleen cells as compared to 99 PFC/10^6 cells in the PCB-treated mice and 110 PFC/10^6 cells in HCB-treated mice. Also, PCB- and HCB-treated mice had primary serum IgA concentrations which were consistently 40-80 mg/dl lower than cotrol values throughout the primary immunization period. Mice immunized with SRBC prior to being placed on the PCB or HCB diets also elicited an impaired secondary PFC response and a slight decrease in serum IgA and IgM. Analysis of tissue contants of HCB demonstrated lung concentrations of 240 μg/g; thymus, 160 μg/g; liver 70 μg/g; and spleen, 50 μg/g. Tissue PCB concentrations in lung were 7.2 μg/g; thymus, 7.1 μg/g; liver, 3.5 μg/g; and spleen, 3.4 μg/g. Morphometric analysis of the spleens did not reveal any change in size, number, or cellular populations of the germinal follices in the PCB- or HCB-treated mice when compared to control values. An increased liver weight, perhaps as a result of the observed centrilobular and pericentral hypertrophys, was evident in the organochlorine-treated mice. It is suggested that in addition to the obvious impairment in immunological responsiveness induced by teh PCB and HCB, the immune parameters may also be sensitive indicators of toxicity. (Author abstract by permission)

77-2494 Villeneuve, D. C. ; van Logten, M. J.; den Tonkelaar, E. M.; Greve, P. A.; Vos, J. G.; Speijers, G. J. A.; van Esch, G. J. (Biochem. Toxicol. Univ. Environ. Health Dir., Health Prot. Branch, Ottawa, Canada) **Combined effect of food deprivation and hexachlorobenzene feeding in rats.** *Toxicol. Appl. Pharamcol.* 41(1): 202; 1977.

Food deprivation has been shown to alter the toxicity and tissue distribution of organohalogens in animals previously exposed to these compounds (Dalt *et al., Toxicol. Appl. Pharmacol.* 4, 89, 1963; Villeneuve, *Toxicol. Appl. Pharmacol.* 31, 313, 1975). However little information is available on the effects of administering such compounds to animals concomitantly exposed to food deprivation. Male and female adult rats were divided into six groups. Groups 1, 3, and 5 were fed standard control diet *ad libitum* for 2 weeks. For the next 4 weeks their respective diets contained 0, 20, and 100 ppm HCB. Groups 2, 4, and 6 were also ed a standard control diet for 2 weeks but an an intake of approximately 50% of those fed *ad libtum.* For the following 4 weeks the 50% level of food was maintained but the idts contained 0. 40, or 200 ppm HCB. After the 4 weeks of HCB exposure all animals were anesthetized, and their organs were excised, weighed, and stored pending residue analysis. Other parameters measured included food intake, body weight changes, microsomal enzyme activity (AH), and histopathological changes in the liver. Food deprivation was observed in increase the ability of HCB to cause liver hypertrophy and induce microsomal enzyme activity. HCB was shown to accumulate to a higher degree in the tissues of animals subjected to food deprivation. HCB induced hypertophy of the cytoplasm of hepatocytes in the centrilobular area and was increased by food deprivation in male rats. These results indicate that food deprivation can alter the biological activity of HCB in rats. (Author abstract by permission)

77-2495 Wagstaff, D. J. ; McDowell, J. R.; Paulin, H. J. (Food Drug Admin. Litton Bionetics, Rockville, MD) **Effects of heptachlor on broiler chickens.** *Toxicol. Appl. Pharmacol.* 41(1): 203; 1977.

This study was done to determine feed levels of heptachlor which would not produce unacceptable tissue residues or adversely affect animal health or productivity. Technical grade heptachlor was fed to broiler chickens during the first 8 weeks of life at 0, 0.01, 0.03, 0.1, and 0.3 ppm of the ration. Residues of heptachlor and its epoxide (HE) were determined in abdominal fat, liver, and muscle at 1, 2, 4, 8, 10, 12, and 14 weeks. Residue levels rose rapidly for 4 weeks and then reached a plateau, e.g., abdominal fat at 8 weeks had four times more pesticide than the ration. When exposure ceased, residues decreased by half in 4 weeks. The apparent depletion was probably due mainly to dilution of pesticide in growing birds. Residues were not uniformily distributed among tissues; liver fat had four times more HE than abdominal fat. Health and productivity was not affected during the growing phase but some laying hens had egg binding. It is concluded that maintaining feed levels of heptachlor at less than 10% of a limit level provides a reasonable margin of safety for residues, but further study is needed to determine whether reproduction in impaired. (Author abstract by permission)

77-2496 Gralla, E. J. ; Fleischman, R. W.; Luthra, Y. K.; Hagopian, M.; Baker, J. R.; Esber, H.; Marcus, W. (Mason

Res. Inst., Worcester, MA) **The absence of porphyria in beagle dogs adminstered hexachlorobenzene for twelve months** *Toxicol. Appl. Pharmacol.* 41(1): 202-203; 1977.

Hexachlorobenzene is known to cause acute hepatic porphyria in a variety of species including man. The toxic effects in dogs was not previously investigated. In the present study this chemical was administered in gelatin capsules to male and female beagles at 1000, 100, 10, and 1 mg/dog/day for 12 months. Mortality, anorexia, and weight loss occurred primarily at the highest but also to a lesser degree at the next lower level. After approximately 3 months, both weight stabilized or losses were regained. Clinical laboratory changes found immediately before death in severely affected animals which may have been related to malnutrition, included anemia, hypoglycemia, hypocalcemia, and testicular degeneration. A dose-related neutrophilia apeared in the two highest dosage groups. No hepatic fluorescence was found at necropsy, indicating that these dogs were free of porphyria. Nevertheless, hepatic fluorescence was induced in female rats by feeding the material which was administered to the dogs. The most widespread pathological lesions were confined to the abdomen and included serositis; necrosis, fibrosis, and steatitis of the omentum; and lymphoid atrophy at the two highest dose levels. Nodular hyperplasia of gastric lymphoid tissue was found in all treated animals including those at 1/mg/day. Four severely affected animals at the highest dose level showed a generalized vasculitis and one had amyloidosis. One dog from each of the two highest levels had bile duct hyperplasia and subchronic per cholangitis. Bile and perienal fat showed a time- and dose-related accumulation of HCB. The beagle dog appears to be resistant to the porphyrogenicity of hexachlorobenzene. (Author abstract by permission)

77-2497 Loose, L. D. ; Silkworth, J. B.; Coulston, F. (Inst. Comp. Hum. Toxicol., Albany Med. Coll., Albany, NY) **Impaired host-defense in mice fed aroclor 1242 or hexachlorobenzene for six weeks.** *Toxicol. Appl. Pharmacol.* 41(1): 203; 1977.

The impaired humoral immune response to sheep erythrocytes in mice fed 167 ppm of PCB or HCB for 6 weeks has been suggested to be a result of macrophage dysfunction. Further studies were initiated to determine the extent of the PCB- and HCB-induced macrophage dysfunction relative to macrophage-mediated impaired host defense. Male Balb/c mice (18-20 g) were maintained on diets containing 167 ppm of Aroclor 1242 or hexachlorobenzene for 6 weeks at which time their sensitivity to gram-negative endotoxin was evaluated. Endotoxin (*Salmonella typhosa*, Difco) was suspended in saline and was administered intraperitoneally and mortality was recorded at 24 hr. The LD50 for endotroxin LD50 of 1000 μg, whereas mice maintained on a diet containing 167 ppm of PCB for 6 weeks manifested an LD50 of 200 μ and HCB-treated mice had an LD50 of 50 μ of endotoxin. Since endotroxin detoxification has been reported to be a macrophage-mediated event, it would suggest an impairment in endotoxin inactivation as a result of the exposure to PCB or HCB. A similar increase in sensitivity to the lethal effects of a *Plasmodium berghei* (NYU-2) infection was observed in mice maintained on the diets containing 167 ppm of PCB or HCB. Inoculation of the mice fed PCB or HCB with the malarial parasite resulted in a markedly enhanced peripheral blood parasitemia and an approximate 50% reduction in mean survival time. The enhanced sensitivity to the lethal effects of the endotoxin and the malarial parasite suggest a significantly impaired host-defense in environmental chemical exposed animals. (Author abstract by permission)

77-2498 Kociba, R. J. ; Keyes, D. G.; Jersey, G. C.; Dittenber, D. A.; Quast, J. F.; Ballard, J. J.; Wade, C. E.; Humiston, C. G. (Toxicol. Res. Lab., Health Environ. Res. Dow Chem. U.S.A., Midland, MI) **Results of a two-year chronic toxicity study with hexachlorobutadiene (HCBD) in rats.** *Toxicol. Appl. Pharmacol.* 41(1): 204; 1977.

Male and female Sprague-Dawley rats were maintained on diets supplying 20, 2.0, 0.2, or 0 mg/kg/day of hexachlorobutandient (HCBD) for up to 2 years. Rats ingesting 0.2 mg/kg/day had no discernible ill effects that could be attributed to this dose level. Ingestion of the intermediate dose level of 2.0 mg/kg/day caused some degree of toxicity, affecting primarily the kidney in which increased renal tubular epithelial hyperplasia was noted. Urinary excretion of coporoporhyrin was also increased at this dose leve. Ingestion of the highest dose level of 20 mg/kg/day caused a greater degree of toxicity. Effects included decreased body weight gain and length of survival, increased urinary excretion of coproporphyrin, increased weights of kidneys, and renal tubular adenomas and adenocarcinomas, some of with metastasized to the lung. In this study irreversible toxicological effects, such as the development of neoplasma, occurred only at a dose level which caused significant tissue injury and other manifestations of toxicity. No neoplasms resulted with dose levels which caused no injury or only mild, reversible injury. (Author abstract by permission)

77-2499 Quellette, R. E. ; Cohen, S. D. (Sect. Pharmacol. Toxicol., Sch. Pharm., Univ. Connecticut, Storrs, CT) **Organophosphate inhibition of tissue esterases and interactions with ester drugs in the mouse.** *Toxicol. Appl. Pharmacol.* 41(4): 214; 1977.

Previous studies in this laboratory have demonstrated that prior inhibition of mouse tissue carboxylesterases by triorthotolyp phosphate (TOTP, TOCP) resulted in potentiation of the acute toxicity of subsequently administered procaine (PRO). From a dose-response standpoint, inhibition of mouse liver hydrolysis of procaine by selected doses of TOTP was closely correlated with increases in procaine-induced loss of righting ability (LRA) and increased PRO lethality. To determine if the observed potentiation might occur with other organophosphates of insecticidal importance, groups of five male mice were pretreated with 1 to 10 mg/kg of Dasanit (fensulfothion) and were sacrificed 1 hr later for determination of brain cholinesterase and liver carboxylesterase activities. A dose of 5 mg/kg did not significantly inhibit brain cholinesterase activity, yet caused greater than 50% inhibition of liver hydrolysis of diethyl succinate (DES), triactin

(TA), and PRO. A time-course study indicated that brain cholinesterase activity and liver PRO hydrolysis were maximally inhibited in 1 to 5 hr and were completely recovered within 18 hr after Dasanit (7.5 mg/kg, ip). In contrast, liver hydrolysis of DES and TA remained 30 and 50% inhibited, respectively, at that time. Thirty-minute pretreatment with 1, 2, 3, 5, or 7.5 mg/kg resulted in 10, 33, 80, 60, and 80% lethality after 175 mg/kg, ip, of PRO yet this PRO dose killed 23% of the corn oil-pretreated mice. Mean durations of LRA for the survivors were 6.4, 15.3, 12.0, 12.2 and 21.5 min, respectively, compared to 6.6 min for PRO-injected controls. Pretreatment of mice with Dasanit (7.5 mg/kg, ip) followed by challenge with PRO 0.5, 2, 10, or 18 hr later resulted in 80, 70, 40, and 15% lethality and durations of LRA in survivors of 21.5, 16.7, 14.7, and 9.9 min, respectively. These results demonstrate that doses of Dasanit which selectively inhibited carboxylesterase activity potentiated the acute toxicity of PRO in mice and suggest that commonly used insecticidal organophoshates may alter the metabolism and toxicity of ester-containing drugs. (Author abstract by permission)

77-2500 Rozman, K. ; Mueller, W.; Coulston, F.; Korte, F. (Inst. Cent. Environ. Saf., Albany Med. Coll., Holloman AFB, NM) **Long-term feeding study of hexachlorobenzene in rhesus monkeys.** *Toxicol. Appl. Pharmacol.* 41(1): 217; 1977.

The high accumulation tendency of hexachlorobenzene in the food chain is well documented in the literature. It was therefore of interest to establish absorption and excretion patterns of HCB in the rhesus monkey with the objective of determining a possible plateau level of storage. The following biological and biochemical parameters were monitored in order to detect possible harmful effects of chronic HCB-intake; metabolism, porphyrine concentrations, hormone concentrations, blood concentrations of HCB, enzyme activities and hematology. For 15 months three male and three female rhesus monkeys obtained a daily dose of 110 μg of [^{14}C]-HCB orally. So far this experiment has proven the expected high accumulation tendency of HCB in the rhesus monkey. The excretion storage pattern shows a very slow approach to a saturation level. The manifold increase of the urinary excretion is remarkable. While the ratio of the major metabolites remained constant, the total amount of metabolism increased significantly. There are strong indications of enzyme induction. Porphyrine and hormone concentrations remained within the normal range. (Author abstract by permission)

77-2501 Crabtree, H. C. ; Lock, E. A.; Rose, M. S. (Imperial Chem. Ind. Ltd., Cent. Toxicol. Lab., Biochem. Mech. Unit, Alderley Park, Nr. Macclesfield, Cheshire, United Kingdom) **The effect of diquat on the gastrointestinal tract of rats.** *Toxicol. Appl. Pharmacol.* 41(1): 219; 1977.

The herbicide diquat (*N,N*-ethylene-2,2′-bipyridilium) is structurally and chemically related to paraquat (*N,N′*-dimethyl- 4,4′-bipyridilum). However, despite similar herbicidal activity these compounds have different toxic actions in animals. Histologocal examinations of tissues from rats given an oral LD50 dose of diquat have failed to demonstrate significant damage to any major organs. At postmortem the main effect appears to be distention of the gastrointestinal tract. Studies have therefore been carried out to quantitate the effects of diquat on the gastrointestinal tract and to assess the relevance of this to mortality. After an oral administration of 900 μmol of diquat/kg (LD50 dose) to male rats, there was a rapid accumulation of fluid in the gastrointestinal tract. This reached a maximum 24 hr after dosing, the excess fluid being about 14 ml. Similar changes were not seen after other diquaternary cations such as hexamethonium dibromide at the same osmolarity as diquat. Following diquat other tissues, especially blood, were severely dehydrated. Twenty-four hours after dosing, the degree of hemoconcentration and the amount of excess fluid in the gastrointestinal tract were related to the amount of diquat administered. Following oral administration of diquat to rats, deaths occurred over 9 days with about 50% of these deaths occurring by 3 days. Rats which lost body weight over the first 24 hr died within the first 3 days and had a significantly higher gastrointestinal fluid content than remaining animals which gained weight. It is concluded that an LD50 dose of diquat causes a rapid, massive shift of fluid from the tissues into the lumen of the gastrointestinal tract following oral administration and that early death (occurring within the first 3 days) are related to this phenomenon. (Author abstract by permission)

77-2502 Stevens, J. T. ; Famer, J. D.; Hall, L. L. (USEPA, Health Eff. Res. Lab., Environ. Toxicol. Lab., Research Triangle Park, NC) **Species comparison of the binding of the organic arsenical herbicide, cacodylic acid, to erythrocytes.** *Toxicol. Appl. Pharmacol.* 41(1): 221; 1977.

A species-specific accumulation of inorganic arsenicals by rat erythrocytes with the formation of a stable complex with hemoglobulin is well docuemented (Lang *et al., Univ. Calif. Publ. Pharmacol.*, 1949). The percentage of the dose of radiolabeled carodylic acid taken up by rat erythrocytes after iv or oral administration did not appear to be dose (150 μg/kg to 200 mg/kg) or label dependent (^{14}C and ^{74}As). The half-lives of [^{14}C]cacodylic acid in the rat erythrocyte were found to be approximately 90, 92, and 76 days after oral, iv or intratracheal administration, respectively. These values agree well with the mean life of the rat red cell, which is 95 days. The half-life of [^{14}C]cacodylic acid administered iv to the rabbit was found to be 25 hr, the percentage dose associated with red cells being 7% as opposed to 16% in the rat. Despite evidence of absorption, erythrocytes taken from the guinea pig dosed orally with 200 mg/kg did not accumulate amount greater than 0.3% as opposed to 21% of the oral dose in rat. In spite of thes in vivo differences in the concentration of the cacodylic acid by erythrocytes with these three species, red blood cells from the rat, rabbit, and human do not differ in their rate of uptake. Affinity constants indicate that cacodylic acid has erythrocyte affinities as follows: rat > rabbit > human. Since the rat of uptake of caco-

dylic acid *in vitro* does not indicate a species difference, this *in vitro* accumulation of organic arsenical must be related to either qualitative and/or quantiative differences of receptor materials with which the arsenical complexes. (Author abstract by permission)

77-2503 Hasan, M. ; Chandra, S. V.; Dua, P. R.; Raghubir, R.; Ali, S. F. (Brain Res. Lab., Dep. Anat., J. N. Med. Coll., A. M. U., Aligarh, India) **Biochemical and electrophysiologic effects of thallium poisoning on the rat corpus striatum.** *Toxicol. Appl. Pharmacol.* 41(2): 353-359; 1977; 1977. (30 references)

Rats were given thallium acetate (5 mg of thallium/kg) ip daily for 7 days. The corpus striatum was removed, and several enzymes and protein estimations were made. Succinic dehydrogenase, monoamine oxidase, acid phosphatase, guanine deaminase and protease (cathepsin) activities in the corpus striatum were depleted by thallium, whereas adenosine trophosphatase and adenine deaminase activity were unaffected. Protein content of the corpus straitum was signficantly increased, which could be due to a depletion of cathepsin and acid phosphatase: sulfhydryl-dependent enzymes were particularly depleted. Single neuron activity of the caudate nucleus, recorded after iv injection of thallium acetate (10 mg/kg body weight), showed an increased firing rate of the caudate neurons, which could possibly be due to an imbalance neurotransmitters. (Author abstract by permission)

77-2504 Boyer, A. C. ; Brown, L. J.; Slomka, M. B.; Hine, C. H. (Shell Develop. Co., Biol. Sci. Res. Ctr., Modesto, CA 95352) **Inhibition of human plasma cholinesterase by ingested dichlorvos: effect of formulation vehicle.** *Toxicol. Appl. Pharmacol.* 41(2): 389-394; 1977. (6 references)

Human subjects were fed 0.9 mg of dichlorvos (2,2-dichlorovinyl dimethyl phosphate) three times a day for 21 days. No consistent cholinomimetic signs or symptoms were observed, nor was erythrocyte acetylcholinesterase inhibited. The only significant in plasma cholinesterase was found to depend on the method by which dichlorvos was incorporated into the diet. Dichlorvos, formulated as a gelatin salad and consumed during the course of the meal, was only 64% as effective in inhibiting ChE activity as when administered as a premeal capsule containing cottonseed oil. The recovery of cholinesterase activity, after dosing was terminated, was due to the replacement of enzyme molecules. The half-life for this regeneration period was 13.7 days. (Author abstract by permission)

77-2505 Braun, W. H. ; Young, J. D.; Blau, G. E.; Gehring, P. J. (Toxicol. Res. Lab., Health Environ. Res., Dow Chem. U.S.A., Midland, MI 48640) **The pharmacokinetics and metabolism of pentachlorophenol in rats.** *Toxicol. Appl. Pharmacol.* 41(2): 395-406; 1977. (17 references)

The pharmacokinetic profile of pentachlorophenol (PCP) was determined in male and female rats to assist in the assessment of its toxic hazard. Metabolism, excretion, and blood plasma concentrations as a function of time were determined for rats given 10 or 100 mg of [^{14}C]PCP/kg. Elimination of PCP from the body was by catabolism to tetrachlorohydroquinone, by excretion of unchanged PCP and its metabolites into the bile. The metabolites of PCP were rapidly excreted via the urine and were not retained in the body. The dynamics for the overall elimination of radioactivity from the body was biphasic in males and females given 10 mg/kg and in males given 100 mg/kg. For females given 100 mg/kg, it was monophasic, suggesting a dose-dependent fate. The rapid phase of elimination had half-lives of 17 and 13 hr for males and females given 10 mg/kg and 13 hr for males given 100 mg/kg. Over 90% of the dose was eliminated during the rapid phase. For females given 100 mg/kg, the monophasic elimination had a half-life of 27 hr. Analysis of the radioactivity in selected tissues from males and females given 10 mg/kg revealed the highest concentrations in the liver and kidneys and the lowest in the brain and fat. In females plasma concentrations of PCP were consistently higher than in males. About 99% of the PCP in plasma was bound to protein, which probably was responsible for low tissue-to-plasma ratios and a low renal clearance rate. (Author abstract by permission)

77-2506 Canty, A. J. ; Parsons, R. S. (14 Chem. Dep., Univ. Tasmania, Hobart, Tasmania, Australia) **Distribution of diphenylmercury in the rat.** *Toxicol. Appl. Pharmacol.* 41(2): 441-444; 1977. (14 references)

Intraperitoneal injection of diphenylmercury into rats results in a much higher initial concentration of mercury in the brain than that following injection of mercuric chloride or phenylmercuric actate. The concentration in the brain than decreases, and after several days it is similar to that resulting from mercuric chloride and phenylmercuric acetate injection. (Author abstract by permission)

77-2507 Sauerhoff, M. W. ; Braun, W. H.; Blau, G. E.; Gehring, P. J. (Health Environ. Res., Comput. Lab., Dow Chem. Co., Midland, MI 48640) **The fate of 2,4-dichlorophenoxy acetic acid (2,4-D) following oral administration to man.** *Toxicology* 8(1): 3-11; 1977. (4 references)

The pharmacokinetic profile of 2,4-D is defined in man. Five male human volunteers ingested a single dose of 5 mg/kg 2,4-D without detectable clinical effects. Concentration of 2,4-D were determined in plasma in 3 of 5 subjects and in urine in all subjects at intervals after ingestion. The elimination of 2,4-D from plasma in all subjects occurred by an apparent first-order rate process with an average half-life (t 1/2) of 11.6 h. All subjects excreted 2,4-D in the urine with an average t 1/2 of 17.7 h. Excretion occurred mainly as 2,4-D (82.3%) with smaller amounts excreted as a 2,4-D conjugate (12.8%). Essentially all of the 2,4-D was absorbed from the gastrointestinal tract in man. Clearance of 2,4-D from the plasma and excretion from the body are first-order rate processes. There was no evidence that 2,4-D would accumulate following repeated administration. (Author abstract by permission)

77-2508 Gaillard, D.; ; Chamoiseau, G.; Derache, R. **Dietary effects on inhibition of rate hepatic microsomal drug-metabolizing enzymes by a pesticides (Morestan).** *Toxicology* 8(1): 23-32; 1977. (30 references)

Female rats were fed for 21 days on 5 semi-synthetic diets containing 8 or 30% proteins, 1 or 25% lipids respectively, the control animals beging given a diet containing 20% proteins and 5% lipids. The animals on each diet were then subdivided into two subgroups and on the 22nd, 23rd, 24th and 25th days were given an oral dose of 75 mg/kg of Morestan (oxythioquinox) in solution in peanut oil (PO) or a dose of oil only. The microsomes were prepared 24 h after the last administration and aniline aromatic hydroxylase, aminopyrine and *N*-methylaniline *N*-demethylase activities and cytochrome P-450, protein and RNA levels were measured. Whatever the diet, Morestan inhibited *N*-demethylase activities and decreased the cytochrome P-450 level; liver protein and RNA levels and microsomal RNA level increased. The 25% lipid diet alone increased activity of the three enzymes studied, without modifying the cytochrome P-450 level; Morestan produced antagonism to this effect in the rats on this diet. The decreased cytochrome P-450 level caused by Morestan was higher in animals on the 8% protein diet. (Author abstract by permission)

77-2509 Declume, C.; ; Benard, P. **Foetal accumulation of [^{14}C]carbaryl in rats and mice: autoradiographic study.** *Toxicology* 8(1): 95-105; 1977. (19 references)

Pregnant female rats and mice (18th day) received orally 10 mg/kg of 1-naphthyl-*N*-methyl-[^{14}C]-carbamate (carbaryl), an anticholinesteratic drug. Animals were sacrified 1, 5, 8, 24, 48, 72 and 96 h after administration and whole-body autoradiography was performed. Autoradiograms of the uterine cavity indicate a placental transfer and a foetal fixation of [^{14}C]carbaryl metabolites. ^{14}C-activity can be clearly seen in the foetus from the fifth hour; it persists till birth. We found ^{14}C-activity in mice 60 h after birth. In both species there are some sites of accumulation in the foetal tissues, mainly in the eyes, central nervous system and liver. (Author abstract by permission)

77-2510 Lovett, E. J., III ; Lundy, J. (Dep. Surg. Univ. Connecticut Health Cent., Farmington, CT 06032) **The effect of thiabendazole in a mixed leukocyte culture.** *Transplantation* 24(2): 93-98; 1977. (23 references)

Spleen cells were harvested following i.p. administration of thiabendazole (TBZ) at a dose of 20 mg/kg to C57BL/c mice, and reacted in a one-way mixed leukocyte culture with irradiated BALB/c stimulator cells. In cases when TBZ was administered 24 hr before the animals were killed, the proliferative response of spleen cells after 5 days in culture was greater than two times that of responder cells from normal, untreated C57BL/6 mice. In this case the reactivity of spleen cells harvested 48 hr after TBZ administration was not statistically different from controls. Although proliferative response of normal responder cells reached a peak on day 6. TBZ treatment 24 hr before the mice were killed caused spleen cells to reach a proliferative peak on day 3, of a magnitude three times the normal proliferative peak on day 6. The population of spleen cells affected by TBZ is in the plastic-adherent fraction. The effect drug of the can be transferred to normal responder lymphocytes by the addition of peritoneal exudate cells from TBZ-treated mice.

77-2511 Rakmatov, U. A. ; Shevchenko, N. Kh.; Baimuradov, T. B. (Uzbek Institute of Veterinary Medicine (UxNIVI), USSR.) **Toksichnost' ritsida dlia ovets. [Toxicity of ricid in sheep.]** *Veterinariya* 3: 92-94; 1977. (Russian)

The toxicity of ricid was studied in sheep. Excitation, increased pulse and respiration rates, moisis, and salivation were observed 1 hr after the oral administration of a single 50 mg/kg dose. Depression, bronchial spasm, muscular tremor, disturbances in motor coordination, hyporeflexia, peresis, paralysis of the limbs, and diarrhea were seen after 3 hr. Similar but less pronounced symptoms were seen in animals given 30 mg/kg p.o. The flesh of sheep killed during the first 3 days after poisoning smelled of ricid. Biochemical investigations revealed increased pH, reduced acidity-oxidizability coefficient, negative benzidine test, and positive formol and oxidation reaction tests. The ricid residue levels measured 32 hr after administration of 50 mg/kg were 1.6 mg/kg in the liver, 1.2 mg/kg in the brain, 0.9 mg/kg in the heart, 0.5 mg/kg in the spleen, 0.45 mg/kg in the lungs, 0.3 mg/kg in the kidneys, and 0.45 mg/kg in the muscles. No residues were found 18 days after the administration of 30 mg/kg. The findings indicate that the meat of sheep treated with oral doses of ricid is fit for human consumption after 20 days.

77-2512 Metelev, V. V. ; Brichko, V. F.; Korzhevenko, G. N. (All-Union Scientific Research Institute of Veterinary Hygiene USSR). **Ostatki nekotorykh FOS i vliianie ikh na ryb. [Residues of some organophosphorus pesticides and their effects on fish.]** *Veterinariya* 4: 100-103; 1977. (Russian)

The effects of methylnitrophos (MNP fenitrothion), phosphamide (PP dimethoate), and trichlormetaphos-3 (TMP-3) on fish were studied under field conditions. The TMP-3 concentrations measured in the water were 4.1 mg/l on the first day and 0.0016 mg/l 40 days after the application of a single dose of 5 kg/ha. The residue levels in fish were 25 mg/kg after 19 days, and 2.5 mg/kg after 40 days. Cooking caused a reduction of the residue level by only 25%. The findings indicate that TPM-3 should not be used near water bodies in view of its stability and cumulative properties. Phosphamide was applied at a rate of 1 kg/ha; the residue levels in the water were 0.87 mg/l in the first day, and 0.0107 mg/l on the 30th day. No residues were found 40 days after application. The residue levels in fish were 9.57 mg/kg on the 5th day, and 0.001 mg/kg on the 40th day. MNP was applied in a dose of 1.5 kg/ha. The residue levels in the water were 0.45 mg/l on the first day, and only traces 17 days later. The levels measured in fish were 6.4 mg/kg on the first day, 0.1 mg/kg 30 days later. The residues of all three preparations were localized mainly in the parenchymatous organs, especially in the kidneys, as well as in the gills. Inhibiton of the

cholinestease activity in the brain, hemorrhages in the liver, necrotic foci in the spleen, and leukocytopenia were observed. NMP and PP caused an increase in the number of polychromatophilic and immature orthochromatophilic erythrocytes.

77-2513 Panchenko, S. E. ; Sokol'skaia, N. P. (Azov Scientific Research Institute of Pisciculture, USSR). **Eksperimental'no-toksikologicheskaia kharakteristika akreksa. [Experimental toxicological characteristics of dinobuton.]** *Veterinariya* (4): 105-106; 1977. (Russian)

The effects of dinobuton on the properties of water and on young carp were studied in model experiments. After introduction into water in concentrations of 0.1-10.5 mg/l, the dinobuton concentration decreased by 60% in 30 days. The rate of decomposition in water at 16-19°C amounted to 0.034 parts day; 95% decomposition took 85.4 days. Concentrations over 0.1 mg/l inhibited the mineralization of nitrogen-containing compounds, and increased the BOD_5 value. Dinobuton, added in concentrations of 5-30 mg/l, killed all fish within 2 hr. The mortality rates were 100% after exposure to 0.4 mg/l, and 40% after exposure to 0.2 mg/l for 4 days. The 96-hr LC_{50} was 0.22 mg/l, the chronic LC_{50} 0.13 mg/l. Dinobuton was found to have no cumulative properties. No residues of dinobuton were found in the fish. A metabolite, dinoseb, was found in a concentration of 0.34 mg/kg on the 15th day of exposure to 0.01 mg/l dinobuton. Another metabolite, tentatively identified as 2-(1-methylpropyl) -4- nitro-6-aminophenol, was found in a concentration of 0.02 mg/kg.

77-2514 Avezov, S. R. ; Khaitov, V. R. (Uzbek Scientific Research Institute of Veterinary Medicine, USSR) **Dopustimye ostatki bazudina v kormakh. [Permissible residue levels of diazinon in feed.]** *Veterinariya* 6: 94-95; 1977. (Russian)

Sheep were fed 2 mg/kg (group 1), 4 mg/kg (group 2), 8 mg/kg (group 3) and 12 mg/kg (group 4) doses of diazinon for 3.5 mo to determine its maximum permissible residue level in feed. The hematological parameters of the first three groups showed no difference from the control, while a 24% increase was found in the leukocyte count in group 4 at 2.5 mo after the start of the experiment. There were no noteworthy changes in the serum AChE, SGOT, and SGPT activity, total protein, and blood sugar levels in groups 1 and 2. At the end of the experiment, the acetylcholinesterase activity was reduced by 19% in group 3 and by 25-30% in group 4. The meat of the experimental animals did not differ from that of the controls in terms of organoleptic and culinary properties. No diazinon residues were found in the organs and tissues of the experimental animals. The benzidine test was positive in the meat of the control animals and in groups 1 and 2, and doubtful in the meat of the animals in groups 3 and 4. The findings indicate that the maximum permissible residue level of diazinon in feed should be set at 4 mg/kg.

77-2515 Shakhbazyan, G. K. ; Shevchenko, A. M.; Borisenko, N. F.; Goncharuk, G. A.; Uvarenko, A. R. (Med. Inst. A. A. Bogomlol'ts, Kiev, USSR). **Novye dannye ob osobennostyakh biologicheskogo deistviya rtutorganicheskikh soedinenii. [New data on some characteristics of the biological effect of organomercurial compounds.]** *Vestn. Akad. Med. Nauk SSSR* 2:22-28; 1977. (10 references) (Russian)

Organomercury compounds have been demonstrated to be highly toxic. They are hazardous to human health in concentrations equal to the maximum permissible concentration (in the workplace) for ethylmercuric chloride, 0.005 mg/m^3. They have been found to exert toxic effects on the stomach, pancreas, liver, heart, and gonads. The immunologic system has also been found to become involved in the pathological process, and the endocrine and central nervous systems may be affected. For these reasons it is recommended that the use of organomercury compounds be stopped.

77-2516 Jacobs, A. ; Hellmund, E.; Eberle, S. H. (Kernforschungszentr. Univ. Karlsruhe, Inst. Radiochem., Karlsruhe, Germany) **Speicherung von organischen Spurenverunreinigungen des Wassers im Korper: Zeit-und Dosisabhaengigkeit der Akkumulation von Hexachlorbenzol und Tetrachlorbenzol im Rattenversuch. [Accumulation of trace water pollutants in living organisms: time and dose dependence of the accumulation of hexachlorobenzene and tetrachlorobenzene derivatives in rats.]** *Vom Wasser* 48: 255-272; 1977. (24 references) (German)

Rats were given various organochlorine compounds in the diet for up to 8 wk, and the uptake and accumulation of the compounds in tissues were measured. The compounds investigated were hexachlorobenzene, 1,2,4,5-tetrachlorobenzene, 1,2,3,4-tetrachloronaphthalene, 2,4,5,6-tetrachloro-*m*-xylene, 2,3,5,6-tetrachloronitrobenzene, and 2,3,4,5-tetrachloroanisole. All of the compounds investigated accumulated in adipose tissue. The concentrations in blood and adipose tissue displayed a maximum during the first 3 wk and reached equilbrium levels in 5 wk. The relation between the dietary levels and the organ levels can be described by a simple expontential law, and thus extrapolation to the pollutant concentration present in the drinking water is possible. These experiments were taken as the basis for considerations on the establishment of limiting values for cumulative chemical compounds in drinking water.

See also 77-2327 77-2330 77-2342 77-2348 77-2350

77-2517 Bajgar, J. ; Fusek, J.; Patocka, J.; Hrdina, V. (Purkyne Med. Res. Inst., Hradec Kralove, Czechoslovakia) **Continual determination of acetylcholinesterase inhibition following organophosphate poisoning using an auto analyzer.** *Acta Biol. Med. Germ.* 36(2): 231-236; 1977. (17 references)

A modified Ellman method was developed for continuous monitoring of acetylcholinesterase in rat blood on the AutoAnalyzer. In the in vivo experiments haparin was administered to rats to prevent coagulation. The rat was fixed in position and a polyethylene catheter was introduced into the lumen of the carotid artery. AChE activity was monitored by connecting this catheter to the Auto Analyzer, along with manifolds for air flushing, heparin solution, DTNB, acethylthiocholine substrate, and tris buffer. Oscillation of the normal blood AChE activity was negligible. Addition of saline in a 1:20 ratio also failed to change the activity. Thus this system is relatively stable and blood pressure or heart rate will not influence the AChE activity determined. In vivo experiments confirmed the fact that EDMM (*O*-ethyl-*S*-(2-dimethylaminoethyl)- methylphosphonothioate is a very potent inhibitor of AChE. The half-life of EDMM administered to female rats at 0.043 mg/kg was 2.4 min. The blood loss was negligible (0.015 ml/min) for at least 60 min of continual sampling for AChE activity determination.

77-2518 Horiba, M. ; Kobayashi, A.; Murano, A. (Inst. Biol. Sci., Sumitomo Chem. Co., Ltd., Takarazuka, Hyogo, Japan) **Gas-liquid chromatographic determination of a new pyrethroid, permethrin (*s*-3151) and its optical isomers.** *Agric. Biol. Chem.* 41(3): 581-586; 1977. (10 references)

Gas-liquid chromatographic (GLC) methods were developed for the determination of 3-phenoxybenzyl *dl-cis,trans*-3-(2,2-dichlorovinyl) -2,2- dimethylcyclopropane -1-carboxylate (S-3151, permethrin or Exmin), its geometrical and optical isomers and its impurities. *dl-Trans* and *dl-cis* isomers were separated from each other on a 2% LAC-2R-446 column and determined by using diocytyl phthalate as an internal standard, and the overall content of S-3151 was obtained by the sum of them. Optical isomers, namely, *d-cis* , *l-cis*, *d-trans* and *l-trans* forms were hydrolysed to the corresponding acids, which were derivatized to the diastereosiomer esters with *d*- or *l*-2-octanol and separated from one another on a 10% silicone DC QF-1 column. The optical isomer ratios were determined by the peak area ratios. The impurities of S-3151 were identified by mass spectometer combined with GLC on a 2% PEG-20 M column and they were determined by programmed temperature GLC. (Author abstract by permission)

77-2519 Suzuki, T. ; Umedzu, K.; Itagaki, Y.; Tuzimura, K. (Tohoku Univ., Anal. Chem. Fac. Agric., Sendai, Japan) **A comparative study on the analysis of herbicide "bromacil" using ECD-gas chromatography and mass fragmentography.** *Agric. Biol. Chem.* 41(5): 775-779; 1977. (6 references)

Analysis methods of a herbicide "bromacil" were studied comparatively in soil and mandarin orange fruit. Bromacil content in tissue of mouse was also measured. Measurement was performed by gas chromatography with electron capture detector (ECD). Mass fragmentography was also studied, which was found to be useful for the residue analysis of this herbicide. (Author abstract by permission)

77-2520 Thompson, J. F. ; Reid, S. J.; Kantor, E. J. (Environ. Toxicol. Div., Health Effects Res. Lab., Research Triangle Park, NC 27111.) **A multiclass, multiresidue analytical method for pesticides in water.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 143-157; 1977. (20 references)

A procedure is reported for the multiclass, multiresidue analysis of pesticides in water. Compounds are extracted from water with methylene chloride, and the extract is concentrated by an evaporative technique utilizing reduced pressure and low temperature. Compounds are segregated into groups using a column of partially deactivated silica gel and sequential elution with four different solvent systems. Carbamate residues, converted to their 2,4-dinitrophenyl ether derivatives, are gas chromatographed *via* electron capture detection as are the parent compounds of the organohalogen compounds. Organophosphorus compounds are determined by gas chromatography using a flame photometric detector. Recovery studies were conducted on 42 halogneated compounds, 38 organophosphorus compounds, and 7 carbamates. Fifty-eight of 87 compounds tested produced recoveries in excess of 80%; another 13 compounds yielded recoveries exceeding 60%, while the recoveries on the remaining 16 compounds fell below 60%. (Author abstract by permission)

77-2521 Moseman, R. F. ; Crist, H. L.; Edgerton, T. R.; Ward, M. K. (Health Eff. Res. Lab., Environ. Res. Ctr., EPA, Research Triangle Park, NC 27711) **Electron capture gas chromatographic determination of Kepone residues in environmental samples.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 221-223; 1977. (10 references)

The pollution of the environment with Kepone (decachlorooctahydro- 1,3,4-metheno-2*H*-cyclobuta[*cd*]pentalen-2-one or chlordecone) by an industrial manufacturer of the pesticide resulted in the contamination of several terrestrial media, including biological life, near the entry of the insecticide into the ecosystem. The substrate investigated and for which residue methodology was developed included river sediment, soil, water, shellfish, and finfish. Rigorous extraction techniques utilizing the Soxhlet apparatus and the Polytron tissue homogenizer were required for complete removal of Kepone from the samples. Finfish tissue was the most difficult to analyze. For this type of substratum, a preliminary cleanup by gel permeation chromatography was required to remove most fo the lipid material followed by a micro Florisil column elution to eliminate polychlorinated biphenyls (PCBs). Cleanup of shellfish and other environemtal samples was accomplished with a micro Florisil column only. Electron capture gas chromatography was used to analyze the sample extracts. Recoveries of Kepone from fortified samples averaged 84% or greater. (Author abstract by permission)

77-2522 Veith, G. D. ; Kiwus, L. M. (U.S. EPA, Environ. Res. Lab., Duluth, MN 55804). **An exhaustive steam-distillation and solvent-extraction unit for pesticides and industrial chemicals.** *Bull. Environ. Contam. Toxicol.* 17(6): 631-636; 1977. (8 references)

A modified Nielsen-Kryger steam-distillation apparatus is presented that provides exhaustive distillation of pesticides and industrial chemicals from water, sediments, and tissue and the simultaneous extraction of the distillate by a small volume of organic solvent. The extract is generally suitable for direct gas-liquid chromatography and analysis without the time-consuming concentration and clean-up procedures. The results of experiments designed to assess the potential of the unit to provide quantitative estimates of trace chemicals are provided.

77-2523 Katayama, M. (Criminol. Lab., Aichi Prefect. Police Headquarters, Nagoya, Aichi, Japan) **[A classification procedure for rapid identification of insecticides by thin-layer and gas chromatography.]** *Bunseki Kagaku (Anal. Chem.)* 26(7): 499-502; 1977. (12 references) (Japanese)

First 58 insecticides were classified into groups I-VIIIa and VIIIb. Group I comprised methylparathion, fenitrothion, parathion, and EPN; group II comprised carbaryl and 8 other *N*-methylcarbamates; group III comprised mixtures of *N*-methylcarbamates and organophosphorus insecticides; group IV comprised 12 organochlorine insecticides such as gamma-BHC; group V comprised five bis(*p*-chlorophenyl) carbinol derivatives such as dicofol; group VI comprised five halogen-containing organophosphorus insecticides having no sulfur such as dichlorvos; group VIII comprised seven organophosphorus insecticides having halogen and sulfur, and group VIII comprised organophosphorus insecticides containing sulfur and no halogen. The specimen to be determined is painted onto a TLC plate with fenitrothion, carbaryl, and malathion as internal standards. By spraying the plate with chromogenic reagents such as sodium carbonate, 2,6-dibromoquinone chloroimide, palladium chloride, *o*-tolidine, potassium tetrabromophenolphthalein ethyl ester, silver nitrate, and citric acid, and heating in a predetermined order, the presence of pre various groups were identified successively. Then each group was extracted, and each component of the group was separately identified via Rf values. All insecticides except for group II are able to be analyzed satisfactorily under the same conditions by gas chromatography using a column of 2% Apiezon L(60%) plus 2% DEGS (40%) on Chromosorb W. Combination of the coloring data and classification procedure is satisfactory for rapid identification of 58 insecticides.

77-2524 Paasivirta, J. ; Enqvist, J.; Raisanen, S.; Paasivuo, P. (Univ. Jyvaskyla, Dep. Chem., SF 40100 Jyvaskyla, Finland) **On the limit of detection of TCDD in gas chromatography.** *Chemosphere* 6(6): 355; 1977.

Previous reports have indicated that the detection limit of TCDD (dioxin) using the electron capture detector in gas-liquid chromatography is not much less than 1 ng, while picogram (pg) sensitivity is needed for analysis of parts-per-trillion levels in some environmental samples. The sensitivity of the ^{63}Ni electron capture detector was reinvestigated in connection with a new high resolution glass capillary column. The dioxin sample was diluted with isooctane and injected with a 1:5 split into a gas chromatograph at 230°C with a 35 m, 0.35 mm i.d. glass column coated with Silar 10 C. Using this system TCDD was clearly resolved from the peaks of impurities, and a TCDD detection limit of better than 0.5 pg was readily obtained.

77-2525 Takeshita, R. ; Yoshida, H. (Dep. Public Health Pharmaceutics, Inst. Pub. Health, Tokyo, Japan) **Dodecylbenzenesulfonic acid-binding polyamide for separation and concentration of polychlorinated biphenyls, terphenyls and dichlorodiphenyldichloroethylene (DDE) in water.** *Eisei Kagaku (J. Hyg. Chem.)* 23(4): 185-190; 1977. (10 references) (Japanese)

The applicability of a carrier (in a column) made by binding dodecylbenzenesulfonic acid with polyamide for separation and condensation of PCBs, polychlorinated terphenyl and DDE in water was studied. It was found that even a very minute amount of these compounds was effectively retained by the carrier, and the retained material could be easily elute with ethanol. After diluting the eluate with water, the material was extracted with hexane, and determined by gas chromatography. The recovery of *p,p'*-DDE from its aqueous solution of 0.1 ppb ranged between 99 and 102%; the small excess was considered to be due to a minute background level.

77-2526 Kiril'chuk, P. P.; Stadnizhenko, A. M. **Opyt ispol'zovaniia ezhektornogo aspiratora dlia vziat'ia prob vozdukha pri primenenii iadokhimikatov. [Experience with the use of an ejector-type aspirator for sampling pesticide-containing air.]** *Gig. Sanit.* 5: 92-94; 1977. (2 references) (Russian)

An ejector type air sampler for air sampling under field conditions for the determination of pesticide concentrations in the air is described. Air is sampled by utilizing the vacuum generated by an air jet emitted from a compressed-air flask. The pesticides are adsorbed on cotton-wool. The new sampler has the advantage of being independent of mains.

77-2527 Aleksandrova, L. G. (Kiev Scientific Research Institute of Industrial Hygiene and Occupational Diseases, Kiev, USSR) **Metody opredeleniia FDN (deistviiuschee nachalo *N,N*-dimetil -*N-meta*- khlorfenilguanidin) v vozdukhe. [Methods for determining FDN (active agent *N,N*-dimethyl -*N-meta*- chlorophenylguanidine) in the air.]** *Gig. Sanit.* 5: 60-61; 1977. (1 reference) (Russian)

Spectrophotometric and thin-layer chromatographic methods for the determination of the fungicide FDN (*N,N*-dimethyl -*N-meta*- chlorophenylguanidine) in air are described. Following absorption in *n*-hexane (suction rate 0.5 liter/min) or adsorption on AFA-KhA-18 (or ash-free "blue

ribbon") filter paper (suction rate 5 liter/min), and purification with *n*-hexane, the optical density is measured at 257 nm. The samples are purified with diethyl ether for thin-layer chromatographic determination. Silica gel KSK and an 8:1 mixture of acetone, ethanol, and water are used for the determination. Dragendorff's reagent in sulfuric acid is used for development. The sensitivity amounts of 5 μg. FDN appears in the form of pink to red spots with *Rf* 0.58-0.68. The recovery rate amounts of 90 12%.

77-2528 Pis'mennaia, M. V.; Klisenko, M. A. (All-Union Scientific Research Institute of Hygiene and Toxicology of Pesticides, Polymers and Plastic Materials, Kiev, USSR) **Analiz mikrokolichestv malorana v vozdukhe. [Analysis of chlorbromuron in air.]** *Gig. Sanit.* 5: 57-59; 1977. (6 references) (Russian)

Thin-layer chromatographic, gas-chromatographic, and spectrophotometric methods for the determination of chlorbromuron in the air are described. Vapors are sampled in chloroform, while AFA-KhA-18 filters are used for aerosols. An alumina plate and benzene as the mobile phase are used for thin-layer chromatographic determination. The pesticide is decomposed at 170°C, and the amine formed is diazotized; 1-naphthol is used for visualization. The sensitivity amounts to 1 μg. The Rf of the spots is 0.37 0.05. A glass column with Chromosorb W (80-100 mesh) is used for gas-chromatographic determination with an electron capture detector. The retention time is 0.53 min, and the sensitivity is 0.5 μg/sample. For spectrophotometric determination, chlorbromuron has a distinct peak at 246 nm in *n*-hexane. The Beer-Lambert law is satisfied in the concentration range of 2-20 μg. The sensitivity is 5 μg/sample. Comparative analyses showed consistent readings for the three different methods.

77-2529 Lebedeva, T. A.; Khokhol'kova, G. A. (Kiev Scientific Research Institute of Industrial Hygiene and Occupational Diseases, Kiev, USSR) **Opredelenie betanala v vozdukhe. [Determination of phenmedipham in the air.]** *Gig. Sanit.* (5): 53-55; 1977. (1 reference) (Russian)

Spectrophotometric and thin-layer chromatographic determination of phenmedipham in the air are described. Air is sampled through an AFA-KhA-18 or "Blue Ribbon" filter. For spectrophotometric determination, phenmedipham is extracted from the filter with ethanol, and the optical density is measured at 236-237 nm in a 1-cm cuvette. The sensitivity amounts to 3 μg/sample. For thin-layer chromatographic determination, the filter is treated with acetone, phenmedipham is reextracted with ether, and the sample is applied to an alumina plate. After the chromatographic plate is exposed to chloroform, the chromatogram is developed with an alkaline solution of diazotized sulfanilic acid, paradimethyl aminobenzaldehyde solution, potassium permanganate solution, or 4-aminoantipyrine (ampyrone) solution. The sensitivity amounts to 3 μg/sample.

77-2530 Koen, E. S. (Hygiene Center, Sofia, Bulgaria) **Polyarograficheskii metod opredeleniya ramroda (propakhlora) v vozdukhe. [Polarographic determination of propachlor in the air.]** *Gig. Tr. Prof. Zabol.* 3: 56-57; 1977. (2 references) (Russian)

A method for the polarographic determination of propachlor in air is described. Air is drawn through two series-connected absorbers containing absolute alcohol or AFA filter (perchlorovinyl fabric) at rates of 1 liter/min and 10 liter/min, respectively. The air volume sampled is 5-50 liters. The retention rate is at least 90-95%. Polarographic determination is performed with 0.01 *n* tetraethylammonium iodide as a background, in the range of -0.6 to 1.3 V. At a relative error of 1-5%, the sensitivity amounts to 0.2 μg/ml. Chlorides and other halogens do not interfere with the determination.

77-2531 Ciupe, R.; ; Ajtay, M. **[Gas-chromatographic determination of 1,2,4-dichlorophenoxy- acetic acid (2,4-D) in biological materials.]** *Igiena* 26(1): 59-62; 1977. (6 references) (Romanian)

A gas chromatographic method, which is easy to perform as well as specific for complex mixtures such as biological products, was developed for determination of 2,4-D. The test substance is extracted from organ specimens with ammonia and methyl alcohol, followed by phosphoric acid and ether. After evaporation of the ether the samples can be stored prior to analysis. The material is treated with diazomethane in ether, then benzene is added and the ether evaporated. The benzene is taken for gas chromatographic analysis with an electron capture detector on a glass column with a stationary phase of 4% diethylene glycol adipate on acid-washed Chromosorb. Recovery rates of 88-92% were obtained following addition of 2,4-D to samples at 1000-4000 ppm. The detection limit was in the nanogram range.

77-2532 Aue, W. A. (Dep. Agric. Chem. Environ. Trace Substances, Cent., Univ. Missouri, Columbia, MO 65201) **Choice of detectors and columns for the analysis of pesticides by GLC.** *Int. J. Environ. Anal. Chem.* 5(1): 1-24; 1977. (19 references)

A lecture presented to the International Symposium on Recent Advances in the Analytical Chemistry of Pollutants in Halifax, Nova Scotia, in August of 1972 discussed the state of the art of pesticide analysis by GLC. Gas chromatography offers a wide range of choices to the analyst; often several approaches are feasible for a single problem. Various aspects of this choice are considered. A conditioned column is assumed to remain constant in composition and properties, but this assumption is not always fulfilled. Surface-modified supports may improve separation efficiencies for a single liquid phase. Support-bonded silicones seem to offer a potential as collection media for environmental pollutants. Existing detectors do not offer the maximum possible sensitivity; the columns used for separation determine the sensitivity. In addition to the well known electron capture detector and the more recent Brody/Chaney detector or alkali flame detector, the mass spectrometer may also be regarded as a gas chromatographic detector. Selective detectors are generally

used in pesticide analysis, since many pesticides contain heteroelements and are present in the samples in very small amounts. The hydrogen flame ionization detector is the most versatile detector for organic trace substances which do not respond adequately in the electron capture detector. The predominant role of detectors has been in the area of quantitative determination, but they may also be useful for qualitative determination.

77-2533 Bussey, R. J. ; Christenson, M. A.; O'Connor, M. S. (Stauffer Chem. Co., Richmond, CA 94804) **Gas-liquid chromatographic determination of *O*-ethyl *S*-(4-chlorophenyl) ethanephosphonodithioate (Stauffer N-2596) and its metabolite in crops, soils, milk and tissues of cattle and chickens.** *J. Agric. Food Chem.* 25(5): 993-995; 1977. (3 references)

A gas chromatograph equipped with a flame photometric detector in the phosphorus mode provided a highly sensitive method for determining residues of *O*-ethyl *S*-(4-chlorophenyl) ethane phosphonodithioate (Stauffer N-2596) and its metabolite *O*-ethyl *S*-(4-chlorophenyl) ethane phosphonothioate in crops, soils, milk, and tissues of cattle and chickens. After extraction, crops and soils required no cleanup prior to chromatography; tissues, milk, and eggs required solvent partitioning.The detection limit was 0.01 ppm for each compound. Recoveries from crops, soils, eggs, milk and most tissues were 76-110% for N-2596 and 75-105% for N-2596 metabolite. Recoveries of N-2596 metabolite from kidney, liver, and cardiac muscle were 0-64%. (Author abstract reprinted by permission of the American Chemical Society)

77-2534 Pyysalo, H. (Tech. Res. Cent. Finland, Food Res. Lab., SF-02150, Espoo 15, Finland.) **A rapid gas-liquid chromatography method for determining benomyl residues in foods.** *J. Agric. Food Chem.* 25(5): 995-997; 1977. (11 references)

A GLC method for determining residues of benomyl as a composite value of MCB (carbendazim) and 2-AB acetates was described. Using a high-resolution glass capillary GLC technique, and nitrogen-phoshorus selective and EC detectors, a sensitivity of 0.00001 ppm benomyl for a 10-g sample was achieved. The method was tested for various vegetables and fruits. (Author abstract reprinted by permission of the American Chemical Society)

77-2535 Newsome, W. H. ; Panopio, L. G. (Food Res. Lab., Bur. Chem. Safety, Foods Direct., Health Protect. Branch, Health Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada, K1A OL2) **A method for the determination of 1,3-dichloropropene, 1,2-dibromoethane, and 1,2-dibromo-3-chloropropane in food crops.** *J. Agric. Food Chem.* 25(5): 998-1000; 1977. (5 references)

1,3-Dichloropropene (DCP), 1,2-dibromethane (EDB), and 1,2-dibromo-3- chloropropane (DBCP) were determined concurrently in foods by extraction with acetonitrile, partitioning into hexane, column chromatography on Florisil, and gas-liquid chromatography with electron-capture detection. Overall mean recoveries (% standard deviation) were 89.6 7.7 for *trans*-DCP from 0.05 to 5.1 ppm, 93.0 7.3 for *cis*-DCP from 0.05 to 5.0 ppm, 92.3 7.6 for EDB from 0.025 to 2.5 ppm, and 97.5 5.4 for DBCP from 0.008 to 0.81 ppm. Minimum detectable limits were estimated to be 3 ppb for DCP, 14 ppb for EDB, and 0.3 ppb for DBCP. (Author abstract by permission)

77-2536 Van Cauwenberge, P. P. ; Gordts, L. A. (Inst. Hyg. Epidemiol., 1050 Brussels, Belgium) **X-Ray fluorescence spectroscopic determination of Br-residues in crops after soil treatment by methyl bromide.** *J. Agric. Food Chem.* 25(5): 1000-1002; 1977. (10 references)

Dried samples of lettuce, pepper, and cucumber cultures, grown on soils treated with CH_3Br and on nontreated soils, have been analyzed for their Br content by x-ray fluorescence spectroscopy (XRFS). Variations in the Br concentrations in the plants have been followed during a growing period of several months. It appears that the levels for the treated soils considerably exceed at all times the maximum values admitted in most European countries and seem to be approximately inversely proportional to the total dry weight material of the crops. The x-ray fluorescent (dispersion) spectroscopic technique, used here, reveals to be perfectly adapted for analysis in this concentration range and may be used as a very rapid screening technique for the detection of bromine in crop material. In order to obtain some information about the accuracy of the technique, the results obtained by this technique have been compared with those obtained by a colorimetric method for a number of cases. (Author abstract reprinted by permission of the American Chemical Society)

77-2537 Cook, R. F. ; Jackson, J. E.; Shuttleworth, J. M.; Fullmer, O. H.; Fujie, G. H. (Res. Div. Dep., FMC Corp., Agric. Chem. Div., Middleport, NY 14105) **Determination of the phenolic metabolites of carbofuran in plant and animal matrices by gas chromatography of their 2,4-dinitrophenyl ether derivatives.** *J. Agric. Food Chem.* 25(5): 1013-1017; 1977. (8 references)

A gas chromatographic procedure suitable for the determination of the phenolic metabolite residues of carbofuran (2,3-dihydro -2,2- dimethyl-7- benzofuranyl methylcarbamate) in potatoes, milk, cow tissue, poultry tissue, and eggs is described. The method involved release of the conjugated phenolic residues by acid hydrolysis, ethoxylation of one of the phenolic metabolites, separation of the phenols from possible carbamate residues, and then formation of the 2,4-dinitrophenyl ether derivatives. A carbon clean-up column was required for potatoes and a Florisil clean-up column for eggs and poultry tissue. No clean-up column was used in the milk and cow tissue procedure. Detection of the derivatized phenols was accomplished by gas chromatography using a nitrogen-specific detection system. Method sensitivity achieved for each phenol component was 0.10 ppm for potatoes, 0.02 ppm for milk, 0.05 ppm for tissue, and 0.05 ppm for eggs. Recovery for the phenolic metabolites averaged

69% over all the matrices analyzed. (Author abstract reprinted by permission of the American Chemical Society)

77-2538 Hummel, R. A. (Analytical Lab., Dow Chem. Co., Midland, MI 48640) **Clean-up techniques for the determination of parts per trillion residue levels of 2,3,7,8- tetrachlorodibenzo-*p*-dioxin (TCDD).** *J. Agric. Food Chem.* 25(5): 1049-1053; 1977. (27 references)

Clean-up techniques are described for gas chromatography-mass spectrometric measurement of parts per trillion levels of 2,3,7,8-tetrachlorodibenzo -*p*-dioxin (TCDD) in nonfat and fat tissue, milk, cream, grain, feed, dry plant material, wet plant material, soil, and blood. A sensitivity of 10 parts per trillion TCDD was obtained for most types of samples. Animal tissue, milk, and cream are digested in an alkaline solution and a hexane extract is cleaned up using sulfuric acid and chromatography on silica gel and alumina. Grain and other plant materials are extracted with hexane first and the oil obtained is digested with alkali. Recovery of 10 to 900 parts per trillion TCDD added to beef fat, soil, and rice averaged 76%. The types of interferences encountered are discussed. (Author abstract by permission)

77-2539 Bose, R. J. (Fisheries and Marine Serv., Vancouver Lab., Vancouver, British Columbia V6T 1X2) **Formation of the *N*-trifluoroacetate of carbofuran.** *J. Agric. Food Chem.* 25(5): 1209-1210; 1977. (7 references)

Carbofuran (2,3-dihydro-2,2- dimethylbenzofuranyl methylcarbamate) reacts rapidly and quantitatively with trifluoroacetic anhydride in deuteriochloroform in the presence of excess pyridine, which serves both as a catalyst and as a competitive base, preventing the formation of the unreactive trifluoroacetic acid conjugate of carbofuran and yielding carbofuran trifluoroacetate for GLC analysis. (Author abstract by permission)

77-2540 Pool, R. A. (California Dep. Food Agric., Sacramento, CA 95814) **A rapid bioassay for pesticide phytotoxicity.** *J. Agric. Food Chem.* 25(5):1216-1218; 1977. (10 references)

A leaf infusion technique which demonstrates low levels of herbicidal activity in chemical compounds was developed. The test is based on determining the differential accumulation of leaf tissue starch as influenced by the phytotoxicity of the applied chemical. The assay is a half-leaf test that can routinely be completed in 6 h using a minimum of equipment. (Author abstract reprinted by permission of the American Chemical Society)

77-2541 Karr, J. J. (Pennwalt Corp., King of Prussia, PA 19408) **Collaborative study of gas-liquid chromatographic method for analysis of microencapsulated methyl parathion insecticide.** *J. Assoc. Off. Anal. Chem.* 60(4): 862-864; 1977. (10 references)

Eleven laboratories collaboratively studied the assay of methyl parathion in two formulations of Penncap-M insecticide. The procedure includes a grinding and extraction step, followed by the determination of methyl parathion by flame ionization gas-liquid chromatography. At the 15% levels, the variance within laboratories was 0.0905, and among laboratories, 0.0755. At the 20% level, the figures were 0.0556 and 0.0205, respectively. The method has been adopted as official first action. (Author abstract by permission)

77-2542 Chapman, R. A. ; Simmons, H. S. (Agric. Canada, Res. Inst., London, Ontario, Canada N6A 5B7) **Gas-liquid chromatography of picogram quantities of pyrethroid insecticides.** *J. Assoc. Off. Anal. Chem.* 60(4): 977-978; 1977. (5 references)

A gas-liquid chromatographic method is described for four newly developed pyrethroid insecticides: 3-phenoxybenzyl (±) *cis,trans*-3- (2,2-dichlorvinyl) -2,2-dimethyl cyclo propane carboxylate,(±)-α-cyano-3- phenoxybenzyl (±)-2-,2,3,3-tetramethyl cyclopropane carboxylate, (±)-α-cyano-3- phenoxybenzyl (±)-*cis,trans*-3- (2,2-dichlorvinyl) -2-dimethyl cyclopropane carboxylate, and (±)-α-cyano- 3-phenoxybenzyl (±)-2-(4-chlorophenyl)- 3-methylbutyrate. The compounds were stable and separated at 230°C on columns of 5% OV-101 on Gas-Chrom Q. All are strongly electron-capturing, allowing quantitation at the 20 pg level with a ^{63}Ni electron capture detector. (Author abstract by permission)

77-2543 Lawrence, J. F. ; McLeod, H. A. (Health Welfare Canada, Food Res. Div., Health Prot. Branch, Ottawa, Ontario, Canada K1A OL2) **Evaluation of electrolytic conductivity detection for gas-liquid chromatographic screening of some organonitrogen herbicides and fungicides in foods.** *J. Assoc. Off. Anal. Chem.* 60(4): 979-981; 1977. (3 references)

Electrolytic conductivity detection for the gas-liquid chromatographic (GLC) screening of 15 organonitrogen herbicides and fungicides was investigated. Spiked samples of crop material were extracted with acetone and the filtered sample extracts were partitioned with methylene chloride-petroleum ether (1 + 1) followed by second and third extractions with methylene chloride. The combined organic extracts were evaporated to dryness and the residues were dissolved in hexane for cleanup on a 2% deactivated Florisil column. The pesticide fractions were determined directly by GLC. All pesticides could be detected at 0.1 ppm in the foods studied. (Author abstract by permission)

77-2544 Agemian, H. ; Chau, A. S. Y. (Canada Cent. Inland Waters, Water Quality Branch, PO Box 5050, Burlington, Ontario, Canada L7R 4A6) **An analysis of pesticide residues by chemical derivatization. V. Multiresidue analysis of eight phenoxyalkanoic herbicides in natural waters.** *J. Assoc. Off. Anal. Chem.* 60(5): 1070-1076; 1977. (24 references)

A multiresidue method is presented for the gas-liquid chromatographic determination of phenoxyalkanoic acid herbicides in natural waters. Extraction efficiencies of different organic solvents are considered in developing a solvent

extraction scheme for these herbicides from water. Reactions for derivatizing these compounds by using pentafluorobenzyl bromide, boron trichloride-2- chlorethanol, and dicyclohexylcarbodimide-2- chloroethanol were studied in order to obtain extracts with low blanks to provide the lowest detection limits. Advantages and disadvantages of the 3 methods are discussed. Retention times are twice as long for the pentafluorobenzyl (PFB) esters as for the 2-chloroethyl (2-Cl) esters under the same conditions, although electron capture sensitivity to the former was greater. The PFB esters are easier to form, but the 2-Cl reaction is more specific for these herbicides. Solutions from the boron trichloride reaction gave the cleanest blanks. (Author abstract by permission)

77-2545 Ludwick, A. G. ; Lau, A. N. K.; Ludwick, L. M. (Tuskegee Inst., Dept. Chem., Tuskegee Inst., AL 36088) **Simple sensitive technique for detecting organochlorine pesticides on thin layer chromatograms.** *J. Assoc. Off. Anal. Chem.* 60(5): 1077-1080; 1977. (11 references)

Chlorinated hydrocarbon pesticides can be quickly detected using commercially available thin layer chromatographic plates dipped in an acetone solution of silver nitrate. The limits of detection are functions of the pesticide, adsorbent, developing system and concentration of the silver nitrate in acetone solution. On exposure to ultraviolet light, 0.002 μg 2,4,5-T produced clear darkening within 30 min on precoated silica gel plates (polyvinyl alcohol binder) coated with a solution of 0.1% silver nitrate in acetone. For this system, a 60-min detection period was necessary for a 0.05% coating solution. On the silica gel plates (polyvinyl alcohol binder, 0.1% silver nitrate), 0.02 μg lindane is detected within 75 min. For alumina plates (polyvinyl alcohol binder, 0.1% silver nitrate), 0.025 μg aldrin is detected within 10 min. Darkening of this plate prohibits the detection of 0.012 μg aldrin. On silica gel plates (polyvinyl alcohol binder, 0.1% silver nitrate), 0.015 μg aldrin can be detected within 45 min. The method described provides sensitivities equal to or exceeding literature values. (Author abstract by permission)

77-2546 Van Auken, O. W. ; Hulse, M. (Southwest Res. Inst., Div. Environ. Sci. Eng., San Antonio, TX 78284) **Extraction and gas-liquid chromatographic determination of hexachlorophene from several plant tissues** *J. Assoc. Off. Anal. Chem.* 60(5): 1081-1086; 1977. (20 references)

Conditions are described for extraction, cleanup, derivatization, detection and quantitation of hexachlorophene (HCP) residues from several types of plant material. Wet plant tissue was homogenized and extrated with ethyl ether, dried, and methylated with excess diazomethane. Samples were precleaned by column chromatography on silica gel with benzene-petroleum ether (1+1), and then 1-10 μl concentrated sample was chromatographed on a 6′ column of 3% SE-30 on 80-100 mesh Gas-Chrom Q. The detection limit for the electron capture detector was < 0.1 ng dimethoxyhexachlorophene and 1 ppb HCP in plant tissue. Recoveries (%) of 11-610 ppb HCP added to tissue averaged 94.3 for tomatoes, 86.4 for green peppers, 92.6 for cucumbers, 93.3 for green beans, 93.7 for peanut hay, and 91.6 for peanut shells. (Author abstract by permission)

77-2547 Van Auken, O. W. ; Hulse, M.; Durocher, C. L. (Southwest Res. Inst., Div. Environ. Sci. Eng., San Antonio, TX 78284) **Extraction, gas-liquid chromatographic detection, and quantitation of hexachlorophene residues from plant tissues high in lipid content.** *J. Assoc. Off. Anal. Chem.* 60(5): 1087-1092; 1977. (20 references)

A method has been developed for the extraction, cleanup, derivatization, detection, and quantitation of hexachlorophene (HCP) residues from 2 types of plant storage tissue high in lipid content. Wet soybean or peanut tissue was homogenized and extracted with ethyl ether and chromatographed on silica gel to remove the neutral lipids. The cleaned up sample was methylated with diazomethane and the dimethoxyhexachlorophene was eluted from a second silica gel column and chromatographed on a 6′ glass column packed with 3% OV-1 or 3% SE-30 on Gas-Chrom Q. The instrument detection limit for the ^{63}Ni electron capture detector was < 0.1 ng for dimethoxyhexachlorophene and about 1 ppb for HCP residue in plant tissue. Recovery of 10-420 ppb HCP added to tissue averaged 90.9 5.7%. Interfering substances were removed, column life was increased, and tailing of the parent compound was peak sharpness was increased, and tailing of the parent compound was decreased by using appropriate column chromatography. (Author abstract by permission)

77-2548 Rangaswami, J. R. ; Prakash, S. R.; Vijayashankar, Y. N. (Ctr. Food Technol. Res. Inst., Infest. Control Pestic. Div., Mysore-570013, India) **Spectrophotometric determination of methomyl residues in selected vegetables, grains, and soil.** *J. Assoc. Off. Anal. Chem.* 60(5): 1093-1096; 1977. (5 references)

Methomyl (*S*-methyl-*N*- [(methylcarbamoyl) oxy] thioacetimidate) is converted to oxime and hydroxylamine by alkali and acid treatment, respectively. Hydroxylamine is oxidized with iodine in the presence of sulfanilic acid to yield *p*-diazoniumbenzenesulfonic acid which is coupled with *a* -naphthylamine to form a crimson *p*-benzenesulfonic acid-azo-α- naphthylamine with an absorption maximum at 520 nm. The relationship between absorbance and concentration of methomyl is linear in the range 0.5-10 μg. The method is sensitive and specific; 0.625 ppm methomyl can be determined in a 40 g sample of selected vegetables, grains, and soil. (Author abstract by permission)

77-2549 Aspila, K. I. ; Carron, J. M.; Chau, A. S. Y. (Inland waters Directorate, Water Qual. Br., Burlington, Ontario, Canada L7R 4A6) **Interlaboratory quality control study of the analysis of water for pesticides.** *J. Assoc. Off. Anal. Chem.* 60(5): 1097-1104; 1977. (10 references)

An interlaboratory quality control study was conducted to provide information to 5 participating Canadian laboratories on their capability in analyzing natural waters

for 10 pesticides. The study was designed to identify the quality of each laboratory's working standards for 15 organochlorine pesticides, and the accuracy and precision of each laboratory's analytical procedures. Fifteen samples were provided, of which 3 were standards prepared for direct injection into an electron capture gas chromatograph. Instructions were provided to use these 3 standards for quantitating the pesticide content (8-150 ng/L) in 5 pairs of 1 L water samples. These paired samples contained 10 organochlorine pesticides approaching natural levels. Results of the study indicated that participants were fairly precise and achieved the designed ratio 1.5 for concentrations in the paired samples. (Author abstract by permission)

77-2550 Onley, J. H. ; Giuffrida, L.; Ives, N. F.; Watts, R. R.; Storherr, R. W. (Environ. Protect. Ag., Registration Div., Washington, DC 20460) **Gas-liquid chromatography and liquid chromatography of ethylenethiourea in fresh vegetable crops, fruits, milk, and cooked foods.** *J. Assoc. Off. Anal. Chem.* 60(5): 1105-1110; 1977. (6 references)

The Onley-Yip procedure for determining ethylenethiourea (ETU) in milk and crops was modified to reduce interferences by the ethylenebisdithiocarbamates (EBDCs). A 20 g cropmethanol extract is cleaned up by adsorbing the sample onto Gas-Chrom S, desorbing ETU, and eluting ETU from aluminum oxide with chloroform containing ethanol. ETU is converted to the S-butyl derivative for gas-liquid chromatography (GLC) and flame photometric detection (sulfur mode). For liquid chromatography (LC), ETU is cleaned up on anther aluminum oxide column and injected directly. LC and GLC results are confirmed by thin layer chromatography. A cooking procedure based on conversion of EBDCs to ETU is included for surveying crops for possible EBDC content. Recoveries from 8 crops and milk fortified at 0.05 ppm ETU ranged from 73 to 100%.

77-2551 Onley, J. H. (Environ. Protect. Ag., Registration Div., Washington, DC 20460) **Gas-liquid chromatographic method for determining ethylenethiourea in potatoes, spinach, applesauce, and milk: collaborative study.** *J. Assoc. Off. Anal. Chem.* 60(5): 1111-1115; 1977. (6 references)

Eight laboratories collaboratively tested a gas-liquid chromatographic method for determining ethylenethiourea (ETU) in potatoes, spinach, applesauce, and milk. In the determinative step, ETU is converted to the *S*-butyl derivative (2-*n*-butylmercapto-2-imidazoline) which is detected by a flame photometric detector, sulfur mode. For unknown fortification levels of 0.06, 0.12, and 0.30 ppm, the collaborators reported an overal average recovery range of 85-97% in the various commodities. The method has been adopted on interim official first action.

77-2552 Yasuda, S. K. ; Loughran, E. D. (Univ. California, Los Alamos Sci. Lab., Los Alamos, NM 87545) **Air sampling methods for S-tetrachloroethane and other related chlorinated hydrocarbons.** *J. Chromatogr.* 137(2): 283-292; 1977. (5 references)

An acid-treated Pittsburgh Activated Carbon (PAC) tube for sampling *s*-tetrachloroethane in air is described that minimizes sample losses through dehydrogenation and dehydrohalogenation reactions. Commercially prepared NIOSH charcoal, untreated PAC, and acid-treated PAC tubes are compared as to their effectiveness in stabilizing *s*-tetrachloroethane. Common homologues and analogues of *s*-tetrachloroethane cause no interference with the gas chromatographic method. In addition the effectiveness of the untreated PAC and acid-treated PAC tubes was also evaluated for four different chlorinated aliphatic hydrocarbons. (Author abstract by permission)

77-2553 Telling, G. M. ; Brinkman, H. W.; Sissons, D. J. (Unilever Res. Colworth/Welwyn Lab., Colworth House, Sharnbrook, Bedford, England) **Determination of organochlorine insecticide residues in fatty foodstuffs using a clean-up technique based on a single column of activated alumina.** *J. Chromatogr.* 137(2): 405-423; 1977. (23 references)

A method is described for the extraction and clean-up of fatty foods prior to the determination of organochlorine insecticides and related compounds. Clean-up is based on the use of a single 22-g column of activity-4 alumina and the method is capable of routinely determining cyclodienes, BHC isomers and HCB at the 5-10 μg/kg level and DDT-type compounds at 20-30 μg/kg level.

77-2554 Kikta, E. J. ; Stange, A. E. (FMC Corp., Agric. Chem. Div., 100 Niagara St., Middleport, NY 14105) **Phenones: a family of compounds broadly applicable to use as internal standards in high-performance liquid chromatography. Application to the analysis of carbofuran.** *J. Chromatogr.* 138(1): 41-45; 1977. (9 references)

Phenones have been employed in high-performance liquid chromatography (HPLC) as a series of compounds forming a rational series of internal standards. It is shown that they are useful in systems as polar as methanol-water (1:1) and in systems as non-polar as methylene chloride-hexane (1:9). The potential in using a stable series of internal standards for many HPLC systems leading to improved quantitative precision and accuracy is discussed. An application to the analysis of carbofuran, a broad-spectrum insecticide-nematicide, is described and discussed. (Author abstract by permission)

77-2555 Lawrence, J. F. ; Lewis, D. A.; McLeod, H. A. (Food Res. Div., Health Prot. Branch, Tunney's Pasture, Ottawa, Ontario, Canada, K1A OL2.) **Detection of carbofuran and metabolites directly or as their heptafluorobutyryl derivatives using gas-liquid or high pressure liquid chromatography with different detectors.** *J. Chromatogr.* 138(1): 143-150; 1977. (10 references)

The gas chromatography of the heptafluorobutyryl derivatives of carbofuran, 3-ketocarbofuran and 3-hydroxycarbofuran is examined with electrolytic conductivity detection (halogen mode). The reaction consists of heating

the compounds with heptafluorobutyric anhydride in the presence of trimethylamine catalyst. Although as little as 200 pg of carbofuran, 400 pg of 3-ketocarbofuran and 100 pg of 3-hydroxycarbofuran can be detected by electrolytic conductivity, the minimum detectable quantities by electron capture are about 20-fold less for each derivative. Application to the analysis of carbofuran and 3-ketocarbofuran in corn, potato, turnip and wheat is carried out. This technique is compared to direct gas chromatography in the nitrogen mode and to direct high-pressure liquid chromatography with UV detection at 254 nm using extracts of field-treated turnips. (Author abstract by permission)

77-2556 Navarro, J. G.; Cornwell, E. S. **Determination of paraoxon by combined bovine liver esterase inhibition and gas-liquid chromatography.** *J. Chromatogr.* 138(2): 423-429; 1977. (17 references)

A combined gas-liquid chromatography and enzyme procedure is described for the determination of organophosphorus compounds that show anticarboxylesterase activity *in vitro*. The method is based on the enzyme hydrolysis of 1-naphthyl acetate and on the determination of both the released 1-naphthol and the unhydrolyzed 1-naphthyl acetate by gas-liquid chromatography. With bovine liver as the source of enzyme the detection limit for paraoxon was 13 ppb. (Author abstract by permission)

77-2557 Brizova, E. ; Popl, M.; Coupek, J. (Inst. Chem. Technol. 166 28 Prague 6, Czechoslovakia) **Use of the sorbent spherone SE in the analysis of trace amounts of impurities in water.** *J. Chromatogr.* 139(1): 15-20; 1977. (7 references)

The determination of the capacity of the sorbent Spheron SE for comparable concentrations of toluene and *m* -cresol in comparison with Spheron MD is described and the advantages of the former in trapping low concentrations of pesticides are demonstrated. A description is also given of the determination of UV-absorbing aromatic hydrocarbons in the presence of phenols, and of the practical application of the method to the determination of trace amounts of hydrocarbons and phenols in surface waters. (Author abstract by permission)

77-2558 Draffan, G. H. ; Clare, R. A.; Davies, D. L.; Hawksworth, G.; Murray, S.; Davies, D. S. (Inveresk Res. Inst., Edinburgh EH21 7UP, Scotland) **Quantitative determination of the herbicide paraquat in human plasma by gas chromatographic and mass spectrometric methods.** *J. Chromatogr.* 139(2): 311-320; 1977. (15 references)

The gas chromatographic (GC) determination of the herbicide paraquat, the 1,1′-dimethyl- 4,4′-dipyridyl cation in human plasma is described. In poisoning cases, plasma concentrations provide a necessary index of the severity of intoxication and a means of monitoring subsequent therapy. The methods may be extended to the specific trace analysis of paraquat in body fluids or *post-mortem* tissue. Reduction of fully ionized paraquat salts with sodium borohydride yields a hexahydro derivative, a diene, amenable to solvent extraction and GC. Employing 1,1′-diethyl- (4,4′-dipyridyl dichloride as the internal standard, plasma concentrations of 0.1 μg/ml (6% S.D.) may be determined with flame ionization detection and 0.025 μg/ml with nitrogen-selective flame ionization. Further enhancement of specificity is achieved using selected ion monitoring mass spectrometry and the value of this technique in forensic analysis is illustrated. (Author abstract by permission)

77-2559 Mundy, D. E. ; Machin, A. F. (Min. Agric. Fish. Food, Ctr. Vet. Lab., New Haw, Weybridge, Surrey KT15 3NB, Great Britain) **Determination of the rodenticide difenacounm in biological materials by high-pressure liquid chromatography with confirmation of identity by mass spectrometry.** *J. Chromatogr.* 139(2): 321-329; 1977. (16 references)

A method for determining difenacoum in liver, plasma, urine and feedingstuffs by high-pressure liquid chromatography is described. Samples are cleaned up by molecular exclusion chromatography on porous glass. In some cases this also serves for determination; if not, the separated difenacoum is determined on an adsorption column. Identity is confirmed by chemical ionisation mass spectrometry. Recoveries at levels of 0.025-5 ppm from plasma were 101-113% by exclusion chromatography alone and 93-101% after adsorption chromatography. Recoveries from liver after both chromatographic steps were 62-86%. Reasons for the lower recoveries from liver are suggested. (Author abstract by permission)

77-2560 Berkane, K. ; Caissie, G. E.; Mallet, V. N. (Dep. Chem., Univ. Moncton, Moncton, N. B., Canada) **The use of Amberlite XAD-2 resin for the quantitative recovery of fenitrothion from water--a preservation technique.** *J. Chromatogr.* 139(2): 386-390; 1977. (8 references)

The usefulness of Amberlite macroreticular resins for quantitative recovery of various organic contaminants from environmental water has been investigated. A multiresidue technique has been developed using these resins to extract organochlorine pesticides and polychlorinated biphenyls from natural waters. Water samples containing fenitrothion were allowed to percolate down a column of Amberlite XAD-2 resin, then the column was eluted with an appropriate organic solvent and the fenitrothion retained was determined by TLC analysis or GLC. The recovery of fenitrothion from distilled water averaged 94% according to in situ fluorometry; the results were confirmed by GLC in experiments with natural water. Fenitrothion degradation was not important within 10 days of the fluorometry experiment, and no degradation was apparent by GLC over a 5-week period. Thus the fenitrothion was stable on the column and the method can be used as a preservation technique. The water sample containing fenitrothion can be processed in the field, and the column can be eluted and its contents analyzed some time afterwards.

77-2561 Lam, S. ; Grushka, E. (State Univ. NY Buffalo, Dep. Chem., Buffalo, NY 14214) **Silver loaded aluminosili-**

cate as a stationary phase for the liquid chromatographic separation of unsaturated compounds. *J. Chromatogr. Sci.* 15(7): 234-238; 1977. (36 references)

A new system was successfully applied to separate isomers of permethrin--a new synthetic pyrothroid pesticide, and series of isomers of C_{18} and C_{16} fatty acids. Microparticulate silica gel was treated with sodium aluminate to give a polyanionic surface which could readily exchange its counter ions for silver ions. The Ag-support is highly selective for unsaturated geometric isomers. It gave short analysis time and good separations. Silver complexation was evident in the Ag-support in comparison with plain silica gel and sodium aluminosilicate. The new column did not suffer from Ag bleeding problems associated with some earlier works.

77-2562 Mieure, J. P. ; Hicks, O.; Kaley, R. G.; Michael, P. R. (Monsanto Co., 800 N. Lindbergh Blvd., St. Louis, MO 63166) **Determination of trace amounts of chlorodibenzo-*p*-dioxins and chlorodibenzofurans in technical grade pentachlorophenol.** *J. Chromatogr. Sci.* 15(7): 275-277; 1977. (7 references)

A method has been developed for determining selected impurities in pentachlorophenol. Chlorodibenzo-*p*-dioxins and chlorodibenzofurans are isolated from the sample matrix with a two-step column chromatographic procedure. Measurement of these components is by gas chromatography using electron, capture, flame ionization, or mass spectrometric detection. The method can be used as a quality control procedure for monitoring these components at ppb-ppm concentrations in technical pentachlorophenol. (Author abstract by permission)

77-2563 Otto, S. ; Keller, W.; Drescher, N. (Agric. Exp. Stn., BASF Aktiengesellschaft Limburgerhof, Germany) **A new gas chromatographic determination of ethylenethiourea residues without derivatization.** *J. Environ. Sci. Health* B12(3): 179-191 (Part B); 1977. (5 references)

A new gas chromatographic method, reliable in the microgram range, was developed to measure ETU residues in various crops. Contrary to previously published procedures, this new method does not require prior derivatization of the ETU. The limit of sensitivity was shown to be 0.01 ppm using the flame photometric detector, FPD (sulfur mode, 394 nm).

77-2564 Takeda, M. ; Sekita, H.; Uchiyama, M. (Natl. Inst. Hyg. Sci., Tokyo, Japan.) **[Studies on analysis of pesticide residues in foods (XXI). Analytical method for captan and captafol in agricultural crops.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(1): 20-25; 1977. (5 references)

Attempts were made to improve the analytical method for captan and captafol in crops contaminated with organochlorine insecticides by ECD gas chromatography. The fungicides could be separated from BHC isomers, *p,p'*-DDT and its analogs, and chlorinated cyclodiene compounds by Florisil column chromatography. The insecticides were eluted from the column with 15% ether in hexane and the fungicides with 30% ethyl acetate in hexane. The second elutate was purified by activated charcoal column chromatography with 50% ether in hexane. Prior removal of oily materials by acetonitrile-hexane partitioning was necessary for some crops. The detection limits were 0.005-0.63 μg for captan and 0.02-2.0 μg for captafol. The recoveries of the fungicides added to crops were 722-90.6% and 795-95.0%, respectively.

77-2565 Fukuhara, K. ; Takeda, M.; Uchiyama, M. (Jap. Food Drug Saf. Res. Cent., Hatano, Kanagawa, Japan) **[Studies on analysis of pesticide residues in foods (XXV). Analytical method for endosulfan in crops.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(2): 149-158; 1977. (14 references) (Japanese)

An ECD-GLC method was developed for determining endosulfan residues in the presence of organochlorine and chlorobenzilate pesticides. Cleanup was done by activated charcoal-Florisil column chromatography. The α-endosulfan which appeared in the first fraction was separated from *p,p'*-DDE on a mixed stationary phase column, 5% O-17, 2% DEGS 0.5% H_3PO_4 and 1% QF-1. Single phase columns were adequate for separating β-endosulfan and endosulfan sulfate from the chlorobenzilate type pesticides. Average recoveries ranged from 82.7% for α-endosulfan to 92.7% for endosulfan sulfate.

77-2566 Jayaram, M. ; Majumder, S. K. (Cent. Food Technol. Res. Inst., Mysore, India) **A thin layer chromatographic method for the estimation of pesticide residues in fatty materials.** *J. Inst Chem. (India)* 68(6): 286-289; 1976. (10 references)

Determination and identification of organochlorine pesticide residues in butter was investigated, with a modification comprising spraying monoethanolamine on the developed TLC plate prior to silver nitrate treatment to hydrolyze interfering fatty acids. Pesticides were extracted from butter with *n*-hexane, then cleaned up with dimethylformamide and chromatography on a column of magnesium silicate, florisil, and anhydrous sodium sulfate. Silica gel plates spotted with test solutions were developed with cyclohexane, then dried and sprayed with monoethanolamine and held at 100°C for 2 min. They were then sprayed with $AGNO_3$ reagent and exposed to ultraviolet rays for 5 min. The clear violet spots were visually compared with standards.

77-2567 Abbosov, T. G. ; Riazhenov, N. I. (All-Union Scientific Research Institute of Veterinary Hygiene, USSR) **Opredelenie ftalofosa v miase, moloke, iaitsakh, rybe i vode. [Determination of phosmet in meat, milk, eggs, fish and water.]** *Khim. Sel. Khoz.* 15(3): 30-31; 1977. (Russian)

Gas-chromatographic determination of phosmet residues in meat, milk, eggs, fish and water is described. Following extraction (with *n*-hexane from water, with acetone from all other materials) the extract is purified; phosmet is reextracted with *n*-hexane and determined on a gas chromato-

graph with electron capture detector, using a column with silanized methylsiloxane on Chromatone, and nitrogen as carrier gas. The column temperature is 230°C, the evaporator and detector temperature is 250°C. With a 70-cm column, the retention time is 1.5 min. Quantitative determination is done by peak height comparison against a reference. The sensitivity amounts to 0.15 ng/sample. The recovery rates are 80 5% for milk, 85 5% for meat and fish, 70 8% for eggs, and 95 5% for water.

77-2568 Levitt, T. (Poisons Unit, New Cross Hosp., London SE14 SER, England) **Radioimmunoassay for paraquat.** *Lancet* 2(8033): 358; 1977.

A rapid analytical method was developed for estimating amounts of paraquat in blood. Antibodies against the herbicide have been developed which provide the basis for a sensitive and convenient radioimmunoassay. The coefficient of variation for the standards tested was less than 4% over the range. Paraquat is not metabolized extensively under test conditions and neither diquat nor morfamquat cross-reacts with the antisera to an appreciable extent. The correlation coefficient between results obtained by radioimmunoassay and gas-liquid chromatography was 0.998. There is a need for analysis of time blood samples from paraquat poisoning victims in order to determine whether prognosis can be reliably related to blood paraquat concentrations.

77-2569 Jones, E. G. (Syst. Res. Lab. Inc., Dayton, OH) **Mass spectrophotometric studies.** *Natl. Tech. Inform. Serv.* AD-A019,521, 223p.; 1975.

Mass-spectrometric investigations of diverse areas ranging from the basic understanding of elementary physical-chemical processes to analyses of trace elements in the environment are outlined. Basic thermodynamics and chemical kinetics of ion-neutral phenomena relevant to the solution of problems of immediate importance to the U.S. Air Force are emphasized. Particular emphasis is placed on electron-affinity determinations of small gaseous species of importance as electron excitation in ion-neutral collision processes of direct application to the understanding and prediction of new laser systems. Sophisticated analytical techniques to quantify trace contaminants such as dioxin in Herbicide Orange and other impurities in solid, liquid, and gaseous environmental samples are outlined. These include sample work-up, column preparation, and gas-chromatographic mass-spectrometric analysis. Techniques for quantitative adsorption and desorption of noxious gases on selectively prepared columns are described. Methods of computer interfacing with mass spectrometers for data acquisition are outlined. These include techniques for treating data from both chemical-phyical and analytical investigations. (Author abstract by permission)

77-2570 Evans, E. S., Jr. ; Davenport, C. D. (Army Environ. Hyg. Agency, Aberdeen Prov. Ground, MD) **Evaluation of a method for field collection of ultra-low volume-size aerosol droplets.** *Natl. Tech. Inform. Serv.* AD-A025,562, 16p.; 1974.

Studies were conducted to develop practical alternates to the hand-wave method for the field collection of ULV-size aerosol droplets. A comparative evaluation between the hand-wave method and settling chambers was made using aerosol droplets of malathion or Klearol, produced by a Micro-Gen MS2W-15, collected on Teflon-coated microscope slides. Settling chambers include large metal US Army shipping containers (MILVANS) and smaller plywood boxes of various dimensions. Results indicated an increased efficiency of the settling technique versus the hand-wave method in the collection of droplets less than 10 micrometers in size. Plywood settling chambers evaluated in this study appear to be a more practical and efficient method for the field evaluation of the aerosol producing efficiency of ULV insecticide sprayers. (Author abstract by permission)

77-2571 Lukens, H. R. ; Williams, C. B.; Dandliker, W. B.; Levison, S. A.; Muryama, D. (IRT Corp., San Diego, CA) **A fluorescence immunoassay technique for detecting organic environmental contaminants.** *Natl. Tech. Inform. Serv.* PB-243,397, 67 p.; 1975.

The report describes the development and successful demonstration of an immunological assay for the detection of low molecular weight organic contaminants of environmental cocern. The specific technique described is a fluorescence polarization immunoassay, the theory of which is presented. The preparation of the two required reagents, namely a fluorescent conjugate of the contaminant of interest, together with an antibody to the contaminant, is described in detail. The specific contaminant chosen for this study was 2-aminobenzimidazole (MW = 133), a metabolite of certain fungicide agents used in agriculture. The particular fluorescent moiety chosen to form the conjugate with 2-aminobenzimidazole with fluorescein. A successful demonstration of the assay has been accomplished, and a detection sensitivity in the sub-nanogram/ml range obtained. (Author abstract by permission)

77-2572 Heller, J. M. (Army Environ. Hyg. Ag., Aberdeen Proving Ground, MD) **Extraction and separation of polychlorinated biphenyls from pesticide monitoring samples** *Natl. Tech. Inform. Serv.* AD-A011,242, 10 p.; 1975. (2 references)

A new method was tested for the removal of polychlorinated biphenyls (PCB's) from biological samples. These industrial chemicals are ubiquitous in biological samples such as fish and bird adipose tissue. Based on retention characteristics they can easily be misidentified as organochlorine pesticides. The PCB's are partially or completely recovered from a Florisil column using the multiresidue methodology for organochlorine pesticides. A silicic acid column was spiked with a solution of 4 PCB's and 11 insecticides. Performance of the method was judged by percent recovery of pesticides along with their complete separation from the PCB's and *p,p'*-DDE. The method performed well with respect to the above-mentioned criteria.

77-2573 Aerospace Res. Labs. (Wright-Patterson AFB, OH) **Analytical methodology for herbicide orange. Volume 1: Determination of chemical composition** *Natl. Tech. Inform. Serv.* AD-A011,597, 363 p.; 1975.

This report describes research performed by ARL at the request of the Air Force Logistics Command to develop and apply analytical methodology to characterize the USAF inventory of Herbicide Orange stocks. A computerized Gas Chromatograph-Mass Spectrometer (GC-MS) system was developed which permitted determination of the 15 to 25 major and minor herbicide components which are typically present in the stocks located at Gulfport, Mississippi. For determination of tetrachlorodibenzo- *p*- dioxin (TCDD), a fully automated GC-Quadrupole MS was developed and used in conjunction with an improved column-chromatography sample-clean-up technique. The analytical methodology is described in detail. Experimental data are included.

77-2574 Aerospace Res. Labs. **Analytical methodology for herbicide orange. Volume II: Determination of origin of USAF stocks.** *Natl. Tech. Inform. Serv.* AD-A011,598, 39 p.; 1975.

A method was developed for gas-chromatographic characterization of chlorophenoxy herbicide formulations: with this method the original manufacturer of the herbicide could be determined. Using a temperature-programmed flame-ionization gas chromatograph, a gas chromatogram was obtained for each of several herbicide specimens. It was found that the amount and type of impurities determined gas chromatographically are characteristic of the original manufacturer of the material. In addition, this simple analytical method was used to determine the homogeneity of the USAF herbicide stocks. These data were used to prepare Environmental Impact Statements for the Environmental Protection Agency.

77-2575 Kojima, M. ; Shiga, N.; Matano, O.; Goto, S. (Institute of Environmental Toxicology, Kodaira, Tokyo, Japan) **[Microdetermination of carbaryl residue.]** *J. Pestic. Sci.* 2(3): 311-314; 1977. (9 references) (Japanese)

A method for determination of carbaryl residue in pear fruit, unpolished rice grain and rice straw by high speed liquid chromatography was developed. Carbaryl in such specimens was extracted with methanol. The extract, after being diluted with saturated sodium chloride solution, was again extracted with dichloromethane, and the solvent was evaporated under vacuum. The residue, mainly consisting of carbaryl, was cleaned up by the coagulation method and/or alumina column chromatography, and carbaryl was hydrolyzed with 0.1% potassium hydroxide-methanol solution. The product, 1-naphthol, was determined on a high speed liquid chromatograph having a glass column packed with Hitachigel No. 3010. The column was eluted with a 95:3:2 mixture of methanol, water and 1/15 *M* phosphate buffer solution (pH 6.4) at a flow rate of 1.0 ml/min, the effluent being mixed with 2% potassium hydroxide in 95% methanol at a rate of 0.5 ml/min. just before flowing into a detector, a fluorophometer with a flow cell. The wave lengths for excitation and for emission were 340 and 460 mn, respectively. No interfering and quenching phenomena of fluorescence were observed in analysis of the above mentioned sample. The lower limits of detection were 0.004, 0.01 and 0.02 ppm in pear (50 g), unpolished rice grain (20 g) and rice straw (10 g), respectively. Recovery of carbaryl, (0.5-2 ppm) ranged from 81 to 87%.

77-2576 Omann, G. ; Lakowicz, J. R. (Univ. Minnesota, Freshwater Biol. Inst., Coll. Biol. Sci., Navarre, MN 55392) **Pesticide uptake into membranes measured by fluorescence quenching.** *Science* 197(4302): 465-467; 1977. (15 references)

Pesticides that contain chlorine have been shown to quench the fluorescence of carbazole-labeled phospholipids. Incorporation of these carbazole-labeled phospholipids into model membranes provides a system that allows the rapid determination of the uptake rates of chlorinated hydrocarbons into model membranes. This techniques can be used in the determination of diffusion rates and partition coefficients of chlorine-containing organic compounds in model membrane systems, and hence may provide a method by which the bioaccumulation potential of synthetic chlorine-containing compounds can be estimated. (Author abstract reprinted by permission of the American Association for the Advancement of Science)

77-2577 Steinwandter, H. ; Schlueter, H. (Hessische Landwirtschaftl. Versuchsanst., D-6100 Darmstadt, Germany) **Beitraege zur Verwendung von Kieselgel in der Pestizidanalytik. I. Eine einfache Multimatrixmethode zur Bestimmung von Chlorkohlenwasserstoff- Pesticiden und polychlorierten Biphenylen. [The use of silica gel in pesticide analysis. Part 1. A simple multi-matrix method for determining chlorinated hydrocarbon pesticides and polychlorinated biphenyls.]** *Fresenius Z. Anal. Chem.* 286(12): 90-94; 1977. (15 references) (German)

A multimatrix method for the isolation of chlorinated pesticides and polychlorinated biphenyls (PCB) is introduced. The quantitative separation of the active substances is achieved with 20 g of silica gel containing 30% of water. The elution is done with 250 ml of petroleum ether. Under these conditions the pesticides are eluted quantitatively; at the same time the column has a capacity to retain fat up to 500 mg. The quantitative identification of the pesticides is performed by gas chromatography (ECD) using different liquid phases, as well as by mass spectroscopy. The recoveries of all pesticides are between 95% and 99%. (Author abstract by permission)

77-2578 Pribyl, J. ; Herzel, F. (Inst. Wasser-, Boden- Lufthyg., Bundesgesundheitsamt, D-1000 Berlin 33, Germany) **Duennschicht-chromatographischer Nachweis herbizider Verbindungen durch Dansylierung. [TLC detection of herbicides by dansylation.]** *Fresenius Z. Anal. Chem.* 286(1-2): 95-99; 1977. (13 references) (German)

The reaction of dansyl chloride with various herbicides and derivatives containing amino groups or hydrolyzable to anilines is described. On TLC plates the fluorescent substances can be readily separated and identified as shown by diagrammatic representation of the thin-layer chromatograms. (Author abstract by permission)

77-2579 Davidek, J.; Henzlerova, J.; Seifert, J. (Dep. Food Chem. Anal., Inst. Chem. Technol., Prague, Czechoslovakia) **Enzymatic determination of dichlofluanid (*N*-dichlorofluoromethylthio)-*N'*,*N'*-dimethylbenzenesulfonamide) by inhibition of papain.** *Fresenius Z. Anal. Chem.* 286(1-2): 100-101; 1977. (6 references)

An enzymatic method for the determination of dichlofluanid was based on the inhibition of papain. The relation of the percent inhibition to the dichlofluanid concentration is linear from 3.0–300 nmoles on a semilogarithmic scale. The method was applied to the determination of dichlofluanid residues in strawberry, leaves of strawberry and some canned products of strawberry, respectively. The lowest quantity which can be determined is 0.1 ppm for strawberry, leaves and puree, and 0.05 ppm for syrup. The recovery varies between 68 and 82%. (Author abstract by permission)

77-2580 Hori, Y. ; Shitara, Y. (Hokkaido Inst. Publ. Health, Sapporo, Hokkaido, Japan) **[Analytical method for organochlorine pesticide residues in onion.]** *Hokkaidoritsu Eisei Kenkyusho Ho (Rep. Hokkaido Inst. Public Health)* 27: 20-23; 1977. (4 references) (Japanese)

Removal of sulfur-containing compounds in onion by performic acid was investigated, as these compounds are known to interfere in the determination of organochlorine pesticide residue in onion by GLC. It was found that the compounds were decomposed by performic acid prepared by mixing formic acid, hydrogen peroxide (30%), and sulfuric acid in the ratio of 90:10:1, allowing the mixture to stand for 30 min at room temperature, and washing with *n*-hexane. Five ml of onion extract (benzene plus acetone, 3:2 ratio) was mixed with 10 ml of the performic acid above mentioned, then the mixture was shaken for 10 min. After adding 40 ml of distilled water to the shaken mixture, it was extracted twice with 25 ml of *n*-hexane each. The hexane layer was washed twice with 10% sodium bicarbonate solution and then with water. The washed layer of *n*-hexane was concentrated to 5 ml for GLC determination. The recoveries of organochlorine pesticides which added to onion homogenated ranged from 80 to 95%, except for heptachlor, aldrin, and dieldrin (71, 73 and 7.5% in that order). This method of decomposing sulfur-containing compounds was also applied for determination of organochlorine pesticide residues in Welsh onion and Japanese radish and gave satisfactory results.

See also **77-2266** **77-2329** **77-2339**

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

Pesticides Abstracts is available on 16 mm microfilm. Additional information can be obtained from the Technical Services Division.

ORDER FORM FOR
PESTICIDES ABSTRACTS

To: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter my subscription for Pesticides Abstracts. I am enclosing Money Order ☐ Check ☐ for this subscription.
($18.25 a year; $4.60 additional for foreign mailing.)

Please address as follows: _____

_____

_____

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 1968
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price, domestic, $18.25 a year, $4.60 additional for foreign mailing. Price for a single copy of this issue is $1.40, Index issue $2.35.

U S ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES PROGRAMS
TECHNICAL SERVICES DIVISION (WH-569)
RM EB-49 401 M STREET, S W.
WASHINGTON, D C. 20460

POSTAGE AND FEES PAID
FOURTH CLASS RATE BOOK

U.S.MAIL

3EPAPP78003A 001364535006 001
SERIALS DEPT.
XEROX UNIVERSITY MICROFILMS
300 NORTH ZEEB ROAD
ANN ARBOR MI 48106

If you do not desire to continue receiving this publication, please CHECK HERE ☐ cut off this label and return it to the above address. Your name will then be removed from the mailing list.